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In the Laps of the Gods

AT this writing the fate of the shipping bill and, incidentally, our merchant marine, lies in the balance. Senator Joseph E. Ransdell, democrat of Louisiana, has just delivered a stirring speech in the Senate in which he showed the bitterness of organized foreign opposition to the pending bill. Many would have us believe that the opposition to the proposed subsidy comes from the Middle West but, if this is true, how does it happen that the Mississippi Valley Association, embracing a membership in 28 states, should address Senator Ransdell, declaring that "proof is now conclusive that the powerful shipping interests of England are determined, if possible, to prevent the enactment of the ship subsidy bill?"

The Mississippi Valley Association, at least, is tired of having the responsibility for the apathy or lack of action by Congress placed upon the Middle West. President Harding evidently entertains the same point of view, for he has made it plain that the bill should pass during this session and that the whole country is behind it. In other words, the "defeatist" propaganda whether started by foreign interests or, as is more likely the case, by Americans employed by foreign interests, should delude no one into the belief that America is not determined to pass this bill the provisions of which are so vital to our merchant marine.

Following Senator Ransdell's speech, President Harding let it be known that he is still determined that the ship subsidy bill shall be passed during the present session of Congress. It must be remembered that he only agreed to a postponement of action on the measure on condition that it would be taken up again before the summer was over. It is therefore our prediction that he will demand that the House shall take this matter up immediately after reconvening on August 15.

The same feeling of uncertainty existed in regard to the reconditioning of the *Leviathan* for a couple of months before the contract was signed. Chairman Lasker of the Shipping Board, however, constantly declared that this great ship would be refitted for service and, just as he was right in his judgment then, so he is now in regard to the shipping bill. He has full confidence that the bill will be passed at this session and he is not allowing himself to be worried over reports that the Senate leaders are trying to eliminate the subsidy legislation from their program.

Chairman Lasker knows that the shipping bill was prepared from the facts and findings of the most competent committees of marine experts ever gotten together in this country. He has had the most exhaustive studies made on the subject as the twenty-five hundred and odd pages of the recent testimony taken before the joint hearings of the Committee of Commerce and the Committee on the Merchant Marine and Fisheries will show. He knows that he is right in advocating ships built and manned by Americans for commercial purposes and for safety in time of war. But of still more importance he knows that the opposition has no arguments that will hold water and that its only hope of defeating the shipping bill is to delay action. This it cannot do unless the country has reached the zenith of its destiny and has started downward.

Economical Fuel Consumption

ONE of the greatest single steps taken by the Shipping Board to secure maximum economy in ship operation has just been started by Mr. Joseph E. Sheedy, acting vice-president of the Emergency Fleet Corporation. Mr. Sheedy has organized a committee under the chairmanship of Captain C. A. McAllister to study the proper basic fuel consumption of Shipping Board vessels, to review present fireroom practices and burning equipment and to recommend improvements in each.

Under present conditions it is absolutely imperative to reduce the cost of ship operation to a minimum and no single item of the operating costs amounts to as much as the fuel bill. MARINE ENGINEERING AND SHIPPING AGE has re-

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peatedly hammered this point for a great many years particularly in the articles written by "Old Scotch." We therefore feel that we have had some influence in creating this committee whose work will undoubtedly be of great value to private shipowners as well as to the Shipping Board.

Senator Marconi Receives Highest Engineering Honor

THE John Fritz medal, America's highest engineering honor, was awarded to Senator Guglielmo Marconi in the auditorium of the Engineering Societies Building on Thursday, July 6. This medal, which is of gold, is awarded not oftener than once a year. It is accompanied by a certificate stating the origin of the medal, the specific achievement for which it is awarded and bearing the signatures of the sixteen members of the board making the award. The board is composed of four representatives from each of the four National Societies of Civil, Mechanical, Mining and Electrical Engineers.

It should be particularly gratifying to the marine profession that the award this year has been made to Senator Marconi. His invention, which was almost immediately applied to ships, has taken from the sea many of its perils and even when disaster has occurred it has been the means of saving large numbers of human lives. In the case of the *Titanic* disaster alone, it is not probable that a single soul would have been rescued, if it had not been for the wireless telegraph.

Radio has made it possible for ships at sea to give their location and condition to the shore and to other vessels; it has made it possible, through triangulation, for shore stations to inform a ship of its exact position and its proximity to dangerous shoals when fog or bad weather conditions prevent the taking of observations; it has made it possible to warn ships of approaching storms, and for them to keep in continuous communication with the entire world. Certainly no one has done more or has been of more benefit to those who live and travel the seas than Senator Marconi.

Cadet Engineers

THE White Star Line is finding it profitable to give engineering students from the Liverpool University a position on their liners during the summer vacation. This scheme, which was inaugurated by Mr. Willet Bruce, the company's superintending engineer, was started last summer and provides a position for an engineering student on each liner leaving Liverpool between July 1 and October 5.

The students either take watches with the regular engineers or are given duties connected with the running of the auxiliaries and the overhaul of deck machinery. The practical experience that they get in this way could not possibly be obtained on shore and those students who seize the opportunity ought upon graduation to have a far better chance of securing a desirable position with a steamship company.

On the other hand the steamship line that gives such an opportunity to engineering students not only secures enthusiastic workers for practically nothing but it also has the chance of picking the most efficient men for future employees. All American lines whose engineering staffs ashore and afloat are not 100 percent efficient might give some thought to such a scheme. Henry Ford has the same idea only in his characteristic big way he has established a school for 600 boys who are given practical training in his shop. The results of these instances of combined theoretical and practical training are for the future to disclose but, if Henry Ford and the White Star Line think it advisable to train their future personnel, other companies might do worse than follow their example.

Simplification and Standardization

DUE to the fact that ships are usually built one or two at a time and then to meet the particular requirements of a specific trade and route, an opportunity to take advantage of the savings that can be accomplished by quantity production of standardized vessels such as were built during the war will never be repeated.

However, there is an opportunity to do much in the way of standardization and simplification in the fittings and equipment that go into a ship. The Navy Department and several shipyards have developed a number of standards for which, in a great many cases, expensive dies, patterns and jigs have been made. The standards of one yard vary to a greater or lesser degree with the standards of another yard and, on account of the above-mentioned expensive dies and patterns, to say nothing of the personal opinions of the chief engineers of the various shipyards, it will be a difficult matter to interest the shipbuilding fraternity in harmonizing these standards and making them universal.

England, however, which is considered more conservative than this country and whose shipyards are much older than ours, is doing this very thing. The British Engineering Standards' Association has appointed committees consisting of men of the highest authority in their respective lines who have met at frequent intervals and examined drawings and sketches of proposed standards.

Not only have they done this, but they have also adopted a large number of standards during the past few years which have eliminated the manufacture of an unnecessarily great number of articles serving one purpose. This has been of substantial benefit to the shipbuilding industry in that country as a whole as it has prevented overlapping, and it is in line with the principle of industrial standardization that has been practiced successfully in other industries.

Mr. Herbert C. Hoover states in an article that appears on page 481 of this issue that the avoidance of waste in the industries is more important than great inventions. He has established in the Department of Commerce a Division of Simplified Practice which stands ready to cooperate and assist the industries to bring together representatives from all interested bodies in any industry for the purpose of effecting standardization and simplification. Is it not a worthy subject for the Society of Naval Architects and Marine Engineers, the American Engineering Standards Committee, the American Bureau of Shipping, the shipowners and shipbuilders to take up with the Department of Commerce in order that the cost of construction of ships between this and foreign countries may be decreased rather than increased?

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Plans for American Marine Week Far-Reaching

To Be Great Convention of All Associations Interested in Developing a Real American Merchant Marine

THE big shipping event of the year, American Marine Week, November 4-11, with its Marine Exposition at the Grand Central Palace, New York City, with its convention of the Society of Naval Architects and Marine Engineers, with the meetings of the technical committees of the American Steamship Owners' Association and the American Bureau of Shipping, and with its banquets and smokers, will be the greatest get-together of the various interests in the marine field that this country has ever seen.

It is the primary purpose of American Marine Week to attract the attention of the whole country to our merchant marine. Shipping legislation is now pending before Congress which is of vital importance, not only to shipping, but also to the prosperity of every other industry. Therefore, this is a time when the cooperative efforts of all marine associations can be used to the best advantage.

American Steamship Owners' Association

Mr. Winthrop L. Marvin, vice president and general manager of the American Steamship Owners' Association, in speaking of the forthcoming event, said, "I believe that this movement is in every way deserving of the heartiest encouragement and I expect that the American Steamship Owners' Association will participate to an even greater extent than they did last year."

At the conclusion of the last American Marine Week, Mr. Marvin made the following statement in a letter to the editor of MARINE ENGINEERING AND SHIPPING AGE: "It is unquestionably the wisest and best plan to hold the annual marine exposition at the same time with the annual convention of the Society of Naval Architects and Marine Engineers. The exposition this year has been remarkably satisfactory from the standpoint of the shipping trade. Exhibits were well considered and skilfully arranged and they strongly appealed to the serious attention of the practical men of our maritime industries. We heartily felicitate the management of the exposition on the valuable results attained."

Society of Naval Architects and Marine Engineers

The annual convention of the Society of Naval Architects and Marine Engineers always has been an important occasion to the leading technical men in the marine profession. It is at these conventions that papers covering the developments in shipbuilding and marine engineering are read and discussed and there is no doubt that these meetings have been of tremendous benefit to the industry as a whole. In commenting on the desirability of holding the annual marine exposition at the same time, Mr. E. H. Rigg, naval architect, New York Shipbuilding Corporation, said last year: "The exposition unquestionably gave an opportunity to those directly interested in maritime affairs, as well as to the general public, whose interest in maritime affairs is undoubtedly much greater than before the war, to see a very full line of maritime equipment and fittings assembled under one roof and in such a way as to be both useful and interesting." There were many in New York for the purpose of attending one or the other of the concurrent meetings, so that advantages should have accrued to each participating organization.

In like manner, Mr. Hugo P. Frear, naval architect of the Bethlehem Shipbuilding Corporation, Limited, in speaking of the last American Marine Week gave his opinion that "the idea of holding the show in conjunction with the meetings of the Society of Naval Architects and Marine Engineers appeals to me and I think this arrangement should be continued so long as there appears to be an advantage in the combination."

American Bureau of Shipping

The American Bureau of Shipping will take part in the forthcoming American Marine Week by holding meetings of their board of managers and their technical committees. The bureau is the only American organization of its kind in this country and it is the official classification society for United States Government-owned ships. It can always be depended upon to support any movement that will aid in the development of an American merchant marine.

Maritime Association

The Maritime Association of the Port of New York, whose fiftieth anniversary will occur next winter, has been invited to participate. Mr. Charles H. Potter, president of that association, when interviewed by a representative of MARINE ENGINEERING AND SHIPPING AGE, declared himself as heartily in favor of the movement. He said that he would recommend participation by his organization at their next meeting.

The Sea-Going Engineers

The Ocean Association of Engineers will hold a big smoker during American Marine Week and they will see that every engineer on every ship in the Port of New York at the time is furnished with tickets admitting them to the marine exposition. Mr. Bert L. Todd, secretary of the association, declared "that he believed that American Marine Week will be a means of interesting the people in an American merchant marine and that it was deserving of support from all organizations connected with shipping."

The Masters and Mates

Capt. John F. Milliken, secretary-treasurer of the Neptune Association, which is composed of the licensed masters and mates of ocean and coastwise steam vessels, and also secretary-treaurer of the Ocean Officers' Conference, which includes the licensed deck and engine room officers and the radio telegraphers, declared that the Neptune Association would hold a big smoker during the week and that probably this smoker would be held in conjunction with the marine engineers. During the week the Ocean Officers' Conference will hold a meeting of its executive committee and officers.

Captain Milliken hopes that there will be an opportunity during American Marine Week for delegates from all marine associations to get together in a special meeting for the purpose of discussing our merchant marine problems and he believes that such a meeting would undoubtedly result in some very valuable suggestions.

National Merchant Marine Association

The National Merchant Marine Association, through its secretary, Henry C. Wiltbank, has notified the American Marine Association that its executive committee is in favor of cooperating in the event and that it will be glad to arrange the details for its participation.

American Marine Association

Steps are now being taken to complete final arrangements of the Second Annual Marine Exposition, to be held under

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the auspices of the American Marine Association, Inc., November 4-11, 1922, at the Grand Central Palace, New York City. The various committees of the association are now actively undertaking the duties assigned to them, in order to assure a most successful gathering of the marine interests. Already space reservations for the November exposition presage an interesting and ambitious presentation of the varied phases of shipping activity, embracing shipbuilding and its allied branches, ship operation and the extensive group of supply organizations.

K. W. Heinrich to Direct Marine Association

In order properly to co-ordinate committee activities, the American Marine Association, Inc., has prevailed upon Mr. K. W. Heinrich, who has been identified with the Bethlehem Shipbuilding Corporation, Ltd., to accept the management and direction of the association. In this capacity, Mr. Heinrich will execute the recommendations of the various committees looking after all details in connection with the exposition and association affairs. It is certain that the cooperation of other marine organizations will be secured to such a degree, that the November Marine Exposition is certain to command national attention, both from its business aspects, as well as the influence it will exert in furthering the interests of an American merchant marine. Mr. Heinrich has had broad experience in exposition development as a result of his work with the Bethlehem Shipbuilding Corporation, Ltd., and this experience, in conjunction with his extensive knowledge of maritime affairs, is expected to give to the American Marine Association many benefits of direct contact with the industry and its allied ramifications.

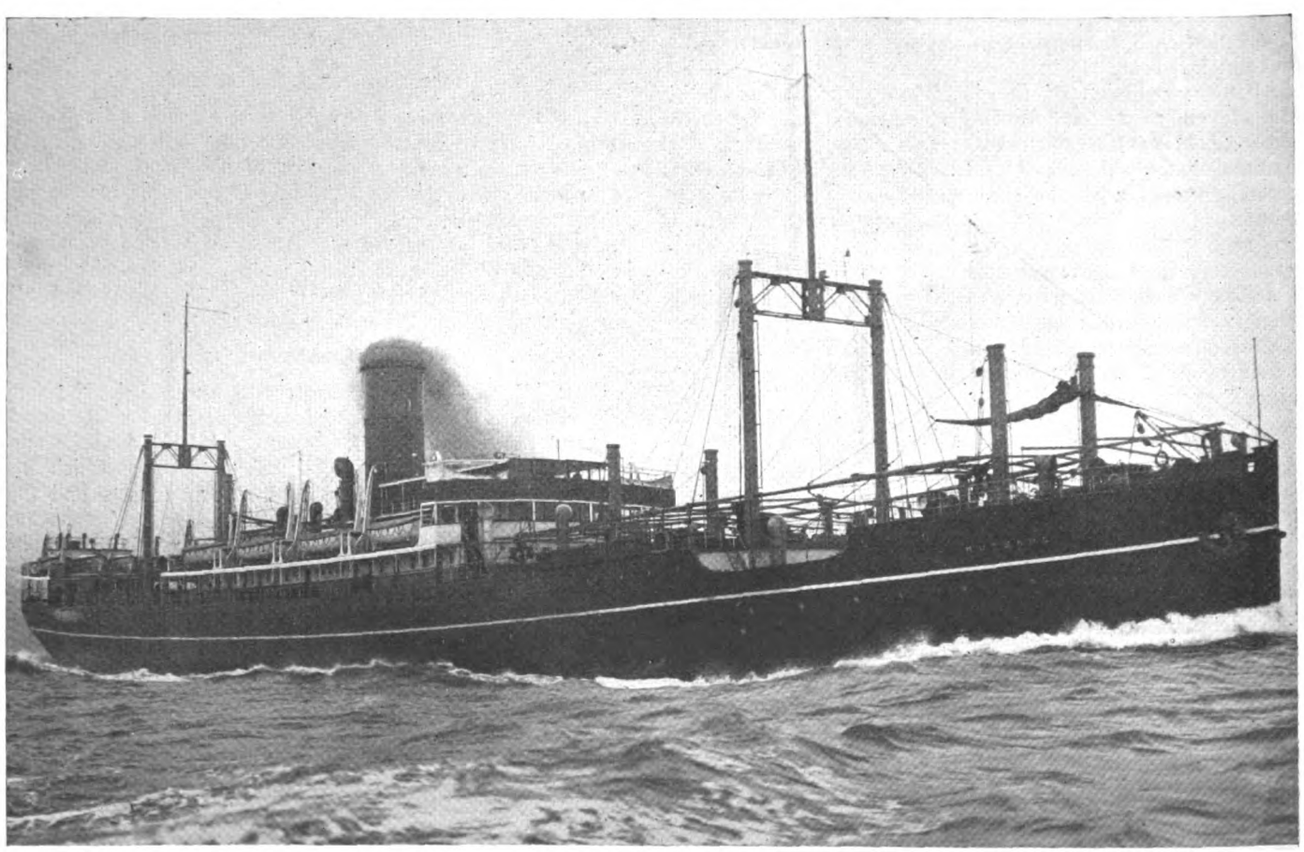
Exhibit Space Reservations

The exhibits committee of the association has about completed its preliminary work and over the next few months it is confidently expected that definite space reservations will be had for the majority of the organizations that participated in the previous exposition, as well as many others who hitherto have not exhibited their products.

The membership committee has been industriously soliciting support from marine concerns, who are not in a position to exhibit, but who are contributing their moral support to the successful consummation of the aims of the association.

Shipbuilders to Be Represented

In an interview with J. L. Ackerson, president of the Atlantic Coast Shipbuilders' Association, a representative of Marine Engineering and Shipping Age has learned that the Atlantic Coast Shipbuilders' Association will be represented at the Marine Exposition by an official committee. Furthermore, this association will help in other ways to make the Exposition and Marine Week an unqualified success in every way. The Atlantic Coast Shipbuilders' Association is the leading organization in the American shipbuilding industry and is the active medium through which shipbuilders seek to secure united action on shipbuilding problems.



Photograph by Frank & Sons, South Shields.

Steamship Kutsang on Her Trial Trip

The Indo-China Steam Navigation Company has just increased its fleet by the addition of the *Kutsang* built at the Wallsend Shipyard of Swan, Hunter & Wigham Richardson, Limited. The ship's name is Chinese and signifies "Increase in Luck." In spite of somewhat boisterous weather, the trials at sea were successfully accomplished and a speed of 13.6 knots on a draft of 23½ feet was averaged over a course of 40 knots along the coast off the mouth of the River Tyne. The *Kutsang* has an overall length of 434 feet, a beam of 54 feet and a depth of 31 feet. She carries 7,800 tons deadweight on a draft of 26 feet 3 inches, and has been built to Lloyds highest class. On the bridge deck are quarters for the officers and engineers together with commodious staterooms and a handsome dining saloon for first class passengers. On the boat deck is accommodation for the captain and for first class passengers, smoking room and ladies' room. Second class passengers are accommodated in the poop, and a hospital and dispensary are placed above the steering gear house.

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Ship Subsidy Bill Stands on Its Own Merits

Educational Campaign Shows Basic Facts Underlying the Bill Irrefutable—Forms Keynote of Policy of Present Administration

By "Old Scotch"

"BOOZE" has been a trouble-maker ever since mankind has made use of it for purposes of exhilaration and to chase away gloom. Just as the stage was set for consideration of the subsidy bill, along comes a famous temperance advocate, a (per force of circumstances) reformed brewer, who spills the beans and starts a general alarm throughout the land because of his discovery that booze was being sold on board passenger ships operated by the Shipping Board. Without knowing anything about the motives which impelled this "nouveau" temperance advocate to jump in the breach at this critical time, it looks to a bystander very much as if there existed in his bosom a sentiment such as "If we can't make it on shore, we'll see that no one sells it on the ocean."

Sale of Liquor on American Ships Never a Secret

Everyone at all cognizant of maritime affairs knew full well that American ships, by competent legal authority, were "wet" beyond the three-mile limit. Nothing was done officially to suppress this fact from the public and anyone having the slightest interest in the matter would have been advised that such was the case. A former United States senator, who was one of the wheelhorses of the prohibition movement, made the announcement in the open Senate in January last, that he had recently returned from London on a Shipping Board vessel and that he saw liquor being sold on that ship. No one expressed any surprise, nor did the press make any more than passing comment on his statement. Yet when this ex-brewer made the same kind of a statement last month, the opponents of the subsidy bill seized the opportunity to raise a hullabaloo which was heard all over the world.

The net result of this re-vivified exposé has been the postponement of the consideration of the bill until August 15, when the House of Representatives reconvenes. This, after all is said and done, is probably a blessing in disguise. It will give Congressmen, who themselves were none too familiar with the subject, a chance to study the subject and take counsel with their constituents as to how they should vote when the bill comes before them. Hence the period from July 1 to August 15 will undoubtedly be occupied to a considerable extent by discussions on the value of a merchant marine to the country at large.

Shipping Legislation the Keynote of Present Administration

The administration officials in Washington are so firmly convinced of the righteousness of the cause that the merchant marine legislation has been made the keynote of the announced policy of the present Government. Whatever the great voting public may think of the actions of the present Congress, or rather the lack of action, there is on all sides a firm conviction that the executive branch of the Government has accomplished much for the benefit of the country, despite legislative shortcomings. Hence it should be realized by congressional candidates for re-election that they themselves are on trial before the bar of public approval, and not the officials of the executive branch of the Government.

The public has strong faith in President Harding's policies and motives, and they undoubtedly give him credit for knowing the conditions which have impelled him to stake the reputation of his entire administration on the success or failure of the pending merchant marine legislation. They know that he is a man from an interior state, a representative of that great middle west which we all speak of with so much veneration as reflecting the last thoughts and actions of the entire country. They know that neither he nor his immediate surroundings have financial interest in the rise or fall of our shipping. He and his co-laborers in this cause have approached the entire shipping subject on the broadest of patriotic grounds, and with a vision that calls for the unstinted approval of all thinking Americans who can look beyond the immediate present and realize how helpless this nation will be in the years to come, if we do not seize this present opportunity and firmly establish an efficient merchant marine to stabilize our commerce in times of peace and to serve as the backbone of our national defense, if war again comes. This very faith of the public in our present executive is in itself a tower of strength and Congressmen, who are wavering in their decision as to whether or not they will support the subsidy bill, should give very careful thought to this factor.

No Sound Reason Yet Advanced for Opposing Subsidy Bill

If facts instead of misinformation are given to the public, there is little reason to have any apprehension as to how they will expect their Congressman to vote on the pending bill. The opponents of the measure have not as yet brought out a single good reason why the bill should not pass. The minority report contains nothing of real value by means of just criticism. The contentions advanced are captious and have little or no bearing on the great underlying principles involved. For example, several pages of the minority report are devoted to the enormous profits made by certain American steamship lines during and just after the war.

What has that got to do with the question? Anybody could make money during times such as we have passed through. No doubt the proprietors of many peanut stands may have made profits of 600 to 1,000 percent during those inflated days. The only difference is that the Government took away most of the shipowners' profits by means of war and excess profit taxes, whereas the itinerant peanut vendor, and like gentry, placed their ill-gotten gains in the family stocking and probably are now living in comparative luxury in their native countries.

Several tables of comparative wages on American and foreign ships are published for the years 1916, 1917, 1918 and 1919, all of which, like "the flowers that bloom in the Spring, have nothing to do with the case" as it exists today, and will not in the future. There is no question in the minds of men who know, that wages paid to officers and men on American ships are now and always will be higher than those paid for like services on foreign ships. The American farmer and the American mechanic are better paid, and should be, than similar vocations in foreign countries. Is it right or fair to expect that Americans who go to sea in American ships should have their standards of living lowered because of that fact? There is now and always will be a higher cost of ship production in this country as compared to similar activities abroad, for precisely the same reasons that exist for the better paid farmer and mechanics. These

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basic facts must not and cannot be lost sight of in the consideration of our merchant marine.

SUBSIDY BILL MEANS ECONOMY—NOT EXTRAVAGANCE

An attempt is now being made in high congressional sources to place the subsidy bill in the list of great Government extravagances. Nothing could be further from the truth. And it is difficult to understand how anyone with sufficient mentality to be elected to Congress can arrive at such a conclusion, after he has given the subject a fair and impartial diagnosis. No doubt many of these legislators are sincere in their convictions and, if they could stop looking at the matter politically and treat solely from the standpoint of statesmanship, they would change their conclusions. As to direct costs of the subsidy, plain ordinary arithmetic, and not statesmanship, is all that is necessary to convince any fair-minded person that this bill should be classed as Governmental saving, instead of an extravagance. Let any one interested make his own calculations based on the following indisputable facts:

(a) By direct appropriation we are now making up the losses of Government operation of ships, to the tune of $50,000,000 per year.

(b) The average amount which will be expended, if the subsidy bill is passed as written, will not exceed $35,000,000 annually, for the entire period of ten years.

(c) We have today in Government ownership a fleet of vessels costing over $3,000,000,000, which, under existing conditions, can hardly be given away. For each month of delay the deterioration on this fleet is enormous and in addition large sums of actual cash must be expended for caretakers.

(d) Passage of the subsidy bill will enable private owners to buy and operate these ships in competition with foreign ship operators. This fact will enhance the sales value of this fleet not less than $300,000,000, and possibly $500,000,000, all of which will be paid into the United States Treasury during the next ten years.

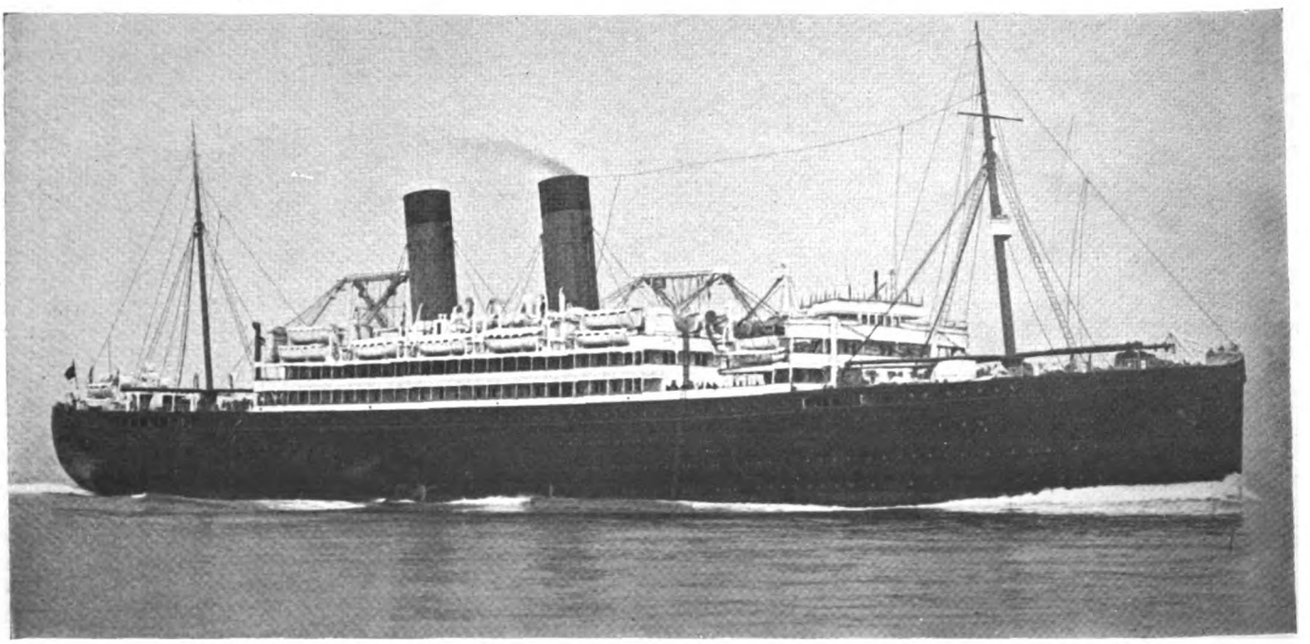
Now so far as the Treasury is directly concerned, and incidentally the great American taxpayer, if any fair-minded citizen can figure out how this bill will be "another drain on the Treasury," "a reckless waste of Government funds," etc., etc., as has been declared, I would like to be shown. Verily the plain ordinary rules of arithmetic would have to be re-written and the laws of common sense reversed, if any such conclusions can justly and fairly be arrived at.

INDIRECT BENEFITS NO LESS IMPORTANT

The indirect benefits which the nation will receive in the fostering of our agriculture and commerce, and the sense of security from attacks of enemies in time of war, are so immeasurable as to defy statistical enumeration. There statesmanship and vision must fill in the columns which arithmetical computations will fail properly to show.

If every American citizen would carefully weigh basic facts in this brief campaign of education we are going through, and not listen to the misrepresentations and quacking which are being spread broadcast throughout our land, there need be no fear as to the ultimate results. What splendid opportunities await our representatives in the House and Senate to make known the basic truths underlying this question of a merchant marine! Let them rise above the carping criticisms of the minor details of the measure now before them and enlighten the public as to the fundamentals underlying the possession of an adequate merchant marine. The President of the United States says it is the most important piece of legislation confronting the country today. Who can say to the contrary, and base his statement on the cold logic of facts?

THE TRAFFIC DEPARTMENT, United States Shipping Board Emergency Fleet Corporation, has received advices that the Atlantic Intercoastal Conferences, at a meeting held in New York on June 28, decided that as a result of the withdrawal of the American Hawaiian Steamship Company from the conference the remaining members had no alternative but to throw rates in this trade open.



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New White Star Liner Pittsburgh, Which Recently Completed Her Maiden Voyage from Liverpool to Boston and Philadelphia

Triple screw passenger and cargo steamer of 16,600 gross tons built and engined by Harland & Wolff, Belfast, Ireland. Length overall, 600 feet; beam, 67 feet 6 inches; molded depth, 45 feet 6 inches; cabin passengers, 600; third class passengers, 1,800. Propulsion is by combination machinery, the wing screws being driven by four-crank, triple expansion reciprocating engines with cylinders 28, 44, 49½ and 49½ inches diameter with a common stroke of 54 inches, and the center screw by a Parsons reaction turbine. Steam is supplied at 215 pounds per square inch working pressure by 6 double ended, oil-fired Scotch boilers arranged for natural draft. Electric generating plant develops over 1,000 horsepower.

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Alien Propaganda Against American Ships

Direct or Indirect Efforts to Prevent America from Safeguarding Commerce and Insuring National Defence Are Unfriendly Acts

By Winthrop L. Marvin*

WHEN Senator James E. Watson of Indiana arose in the Senate recently to rebuke the British Ambassador, Sir Auckland Geddes, for speaking too freely to American audiences against President Harding's shipping bill and a protective tariff, Mr. Watson voiced in parliamentary but earnest language a thought that had long been in the minds of many American citizens. A few days thereafter Sir Auckland departed from New York, ostensibly for a vacation in his own tight little isle beyond the herring pond. There may or there may not be any connection between these two episodes, but there can be no mistaking the fact that the American people are sensitive to anything that looks like interference from foreign quarters with the policies bearing upon American business and the American merchant marine.

American shipping men are perfectly well aware that the aspirations of this nation to possess a merchant fleet comparable with that owned and operated by our forebears prior to the Civil War are not exactly regarded with favor in the United Kingdom. Up to a few days ago the British newspapers dealing with maritime and mercantile affairs were singularly incautious in attacking the shipping subsidy bill of our National Administration and were openly hoping and predicting that it would fail. These British editors are apparently oblivious to the fact that some 10,000,000 gross tons of shipping had been built or started in the United States for the primary purpose of saving Great Britain and France and Italy, and incidentally the world, from the onslaughts of the Huns. Most of these ships were built in a hurry, many of them, perhaps, not on the wisest plans. Because of the emergency they could not be called typical products of American shipbuilding. Confessedly they had their faults, and since the armistice these faults have been constantly paraded in the British press in a manner that cannot be said to be consistent with the best ideals of international propriety.

Our Coastwise Policy Criticized

But these things are trivial in comparison with the very frank campaign which the distinguished British Ambassador had plainly been making in the United States, notably in public addresses chosen for deliverance at those great mid-Western maritime centers of Minneapolis and Chicago. At Minneapolis, in a set speech before the Civic and Commerce Association on November 4, 1920, Sir Auckland had dropped an admonition, which he was careful to insist was not at all a threat, that, if the United States government extended its coastwise policy to include the Philippines, there might be some very serious reprisals from Great Britain. Though his language was not at all boisterous, his meaning was clearly evident in what the British diplomatist said. In the course of his address at Minneapolis he spoke at some length on the subject of shipping, saying in particular:

"Under your laws only American ships may engage in American coastwise traffic. This is a matter for your own decision; we make no comment on your policy. Our present policy is that any ships may engage in British coastwise traffic. I may, however, point out, not in any sense as a threat, however veiled, but as a matter of interest that if a law precisely similar to your coastwise traffic law were adopted by the British Empire, there would be some far-reaching derangements in the business of non-British shipping."

Language of this kind would never have been uttered by a British Ambassador in hot-tempered, quick-triggered France. Nothing like it as against Teuton aspirations for a merchant marine would ever have been uttered by an envoy of His Britannic Majesty in Germany. Of course it is different in the United States. Our people are historically more tolerant, not to say thick-skinned. And neither Minneapolis nor Chicago can be said to be as profoundly interested in the unfolding of the American merchant flag at sea as Boston or New York or Baltimore or New Orleans. Nevertheless, under the circumstances these words of Sir Auckland Geddes at Minneapolis were words that might better have been left unsaid.

Similar American Interference Hard to Imagine

It is impossible to imagine the American Ambassador at the Court of St. James in a public address at Birmingham or Manchester prior to the writing of the agreement between the British government and the Cunard Line for the enormous subsidy that produced the *Lusitania* and *Mauretania*—it is impossible to imagine the American representative in Great Britain using words similar to those which Sir Auckland Geddes employed to his Middle Western audiences. As a matter of fact, no American Ambassador in Great Britain at that time would have even remotely mentioned the Cunard contract, to say nothing of entering an adroitly veiled protest against its making. When the British Parliament, without a dissenting vote, directed the loaning of about $12,000,000, at 2¾ percent, to the Cunard Steamship Company for the building of the two greatest and fastest steamships in the world, and at the same time approved an annual subsidy of $1,100,000 for twenty years from which the loan could be repaid, the Parliament was placing an absolute barrier across the path of the development of a great transatlantic American steamship service without some equivalent aid from the United States. Yet it did not occur to any American official to interfere with this new and formidable British maritime procedure or to suggest that it was nobody's business, except the business of the British government and people themselves.

They do these things differently in America and in Great Britain. Sir Auckland Geddes saw no reason why he should not follow up his Minneapolis address with other addresses in various parts of the United States. What Senator Watson quoted Sir Auckland as saying in his Chicago speech was something to the effect that the United States, having two-thirds of the gold in the world, might well employ the service of British ships in part payment of debts which Great Britain owed us. Later, I believe that the British Ambassador pleaded that his actual words were misunderstood—that he did not utter exactly this language. But there has been no disclaimer whatsoever of the very much more aggressive and insistent previous statements at Minneapolis.

There has been a great deal of recent talk about alien propaganda against the American merchant marine. There are those persons, American and otherwise, who are given to insisting that there is not and never has been such propaganda in America. Senator Watson manifestly is one of those who are of a different way of thinking—and when he spoke in dignified but emphatic criticism of the activities of Sir Auckland Geddes he also referred to the outspoken

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arguments against the American protective law that were being proclaimed by the Italian Ambassador, Signor Ricci. It may or it may not be a mere coincidence that shortly after Ambassador Ricci also departed from the shores of the United States.

Shipping Bill Unpopular in Foreign Countries

Americans who receive copies of the European press can have no doubt whatever in their minds that the American shipping bill is exceedingly unpopular in the commercial ports and the seats of government on the other side of the Atlantic. Every week brings accumulative evidence of this fact when the issues, not of the sensational but of the solid, conservative European journals, are delivered on this side of the Atlantic. If Europe were able to dictate the division on President Harding's shipping bill in the American Congress, that measure would not receive a single vote.

It matters not at all, apparently, that the European nations —Great Britain first of all—long years ago themselves set the example of subsidizing or otherwise assisting their National shipping industries. American statesmen who can see in shipping subventions nothing more than "raids upon the treasury" never used more violent language in denunciation of our shipping plans than the journals of the maritime countries beyond the Western Ocean. They hate the American shipping subsidy bill because they fear it, as more than one of the assailants have had the frankness to declare. Thus *Syren and Shipping*, London, of March 8, 1922, laments that "There is cold comfort for British shipowners in President Harding's message to Congress supporting the proposals of the United States Shipping Board. Whether the desired subsidy will be forthcoming remains to be seen. It has been demanded before and not granted. But the present campaign for State aid is far more potent than its predecessors." Subsequently, on March 22, 1922, this same London journal, having studied the full text of the measure, adds: "An examination of the text of this 'Merchant Marine Bill, 1922' does not lead us to alter our views either as to the earnestness of its sponsors in their efforts to establish an effective mercantile marine, or the seriousness of the competition which would follow the inauguration of such a wide-reaching plan as is suggested."

President's Patience Strained

It is not improbable that President Harding had Sir Auckland Geddes' unwise Minneapolis utterance and the threatenings of the transatlantic press in mind when, in his recent letter to Mr. Mondell, floor leader of the House of Representatives, he said:

"Let me point out what I believe to be a well-screened source of opposition to an outstanding and confident American course in this matter. No well-developed maritime power of the Old World is craving the development of our shipping. We cannot complain thereat. I confess an admiration for the national spirit which always thinks of the interests of the homeland first. I crave its manifestation here at home in solving this problem. Other nations know the value of sea carrying as an adjunct of trade, and the individual discouragement abroad to our worthy aims—a discouragement often insidiously disseminated here—ought to argue an American interest no longer to be ignored."

Our American President is the soul of patience and good humor. But he felt convinced that it was imperative to speak out when he framed these words—and the significance of them will not be lost upon the country. Those American citizens who read first the anti-shipping arguments of foreign origin and then peruse the arguments of those American statesmen from the inland States who are fighting the shipping bill in Congress cannot but be struck by the close similarity not only of the ideas but of the language of the foreign and domestic outgivings on this subject. Sir Auckland Geddes' protest that Great Britain never bestowed any shipping subsidies is echoed in identical language in the recent minority report from the Committee on the Merchant Marine and Fisheries. Yet all along the Atlantic and the Gulf coasts there are thousands of practical American shipping men who know very well the history of the Cunard Line, of the Royal Mail Steam Packet Company, of the Peninsular & Oriental and of other National steamship services which connect the United Kingdom with the chief ports and markets of the world. These men all know that it is as accurate and just to say that Great Britain never granted steamship subsidies as it would be to declare that the United States never had any system of protective tariffs! A British Ambassador may "get away" in Minneapolis with an assertion that such things as subsidies to ships have never been known in the United Kingdom—but in Boston, or New York, or San Francisco such a remark would merely win for Sir Auckland the reputation of being an unconscious humorist.

Europeans Know Bill Will Help American Shipping

Those editors, shipowners and shipbuilders of Europe who are openly carrying on a propaganda against the American shipping bill have an undoubted right to protest against American shipping legislation—in their own newspapers, their own ports and at a distance. They know as well as do American shipping men that this proposed bill of President Harding is a formidable measure—that it will most certainly result in a substantial increase of the American merchant marine and naval reserve, and that it will operate to promote American commerce and to strengthen American resources for the National defence.

For their own reasons these gentlemen would, of course, prefer to have America continue to be weak upon the seas. But our kin and friends of Europe have no shadow of a right to make any effort to project their propaganda, through their diplomatic representatives or otherwise, to American soil, be it in Minneapolis or Chicago or Washington. In our own country this problem of the American merchant marine is a problem to be settled by the American people and their Senators and Representatives in Congress, without foreign advice and without foreign interference.

Former German Interference Proved

During the years preceding the world war there was a very open and conspicuous propaganda in this country against any effort whatsoever to strengthen American ocean shipbuilding and navigation. The Gallinger shipping bills in particular were violently opposed in the American press throughout the country by statements made directly by the official heads of the great German steamships companies, the North German Lloyd and Hamburg American. Unquestionably these arguments had a certain effect, particularly on the considerable "German vote" in the Middle West and in Congress. The full character and extent of this German propaganda could not at that time be ascertained by those who were interested in the development of the American merchant marine. But when the United States itself entered the world war in 1917, our government seized the head offices of the German steamship magnates in New York, and in these offices confiscated great quantities of correspondence, including, it is understood, letters that had passed between these German magnates and their hired agents and representatives in Washington. These records are now in the possession of the United States Shipping Board or of the Department of Justice.

What was conjectured is now known to be a fact, that the heads of these Teutonic corporations had their men in Washington to report upon all developments calculated to upbuild an American merchant marine, and that instructions were given as to how these efforts could best be defeated—as they were defeated by a very narrow vote, from States where the German element was strongest.

British Interests Warned

All this is history now—it is of the past. But I would venture to suggest to perhaps overzealous representatives and

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agents of British steamship interests and their "listening stations" in this country, that it would not be exactly a comfortable thing, if it developed that there were a widespread British propaganda here against President Harding's present effort to upbuild American shipping. The American people, because of events preceding and during the world war, have learned to be exceedingly resentful of alien propaganda of any kind. They frankly did not like the recent utterances of Sir Auckland Geddes, as Senator Watson's effective protest has shown. It would be most unfortunate for the continuance of good feeling between the American and the British peoples, if there were any further developments along this line. For it is just as unwise and just as grave an impropriety for British interests of any kind to meddle with the course of American legislation, especially pertaining to the merchant marine, as it would be for American interests of any kind to seek to interfere with the efforts that are constantly and properly being made in the British Parliament and by the British Board of Trade to strengthen further the already formidable power of British shipping.

One point in particular our British kinsmen, if they are real friends of ours, will carefully bear in mind—and that is that the recent Washington conference on the limitation of armaments solemnly agreed that the battleship fleets of the United States and of Great Britain should hereafter be equal, and that the battleship fleet of Japan should bear to them both a relation as of three to five. That agreement is being faithfully carried out, so far as the actual fighting units are concerned, by the three nations most vitally interested. But there should be no need of reminding the British government and people, of all governments and peoples, that effective naval strength is not a mere matter of battle line alone —that there must also be an adequate, effective merchant reserve behind it. As Admiral William S. Sims has lately and wisely said, "The navy of the United States would be of very little value as a defence of the United States and our possessions, if it were not for the merchant marine."

The American aspiration for the possession through National aid of an adequate merchant marine and naval reserve is an instinctive sequel of the Washington conference, without which a great purpose of that conference will be nullified so far as concerns America herself. Our nation requires a proper merchant fleet for the safeguarding of our commerce and also as a vital resource of the National defence—and any effort, direct or indirect, on the part of a foreign government and people to thwart America's aspiration along this line ought to be understood on both sides of the Atlantic to be an effort so unfriendly that it should be inconceivable.

Further Attempts to Delay the Ship Subsidy Bill

Responsibility Rests with Congress—President's Attitude Unchanged —Sentiment in Middle West Favoring Ship Subsidy Grows Stronger

By Harold F. Lane

WASHINGTON, D. C.

OPPOSITION among Republican members of the Senate to the efforts of the President toward prompt and favorable action on the ship subsidy bill has made its appearance since consideration of the bill in the House was postponed in order to enable the House to take an adjournment to August 15. A recent canvass of the Republican senators, although the exact results were not announced, is said to have developed the fact that there is a strong sentiment against bringing the measure up this summer, and at a recent meeting of leaders of the Senate at the home of Senator Lodge of Massachusetts, steps toward side-tracking the bill were discussed. Among those present, agreement was reached in favor of postponing the bill until after election and while the President was away at the time it is understood that the results have since been reported to the President by Senator Lodge.

President Harding has been so busy of late in his endeavors to deal with the coal and railroad strikes that he has been unable to give very close attention to the prospects of the shipping bill but undoubtedly he is being subjected to considerable pressure to alter his determination to call an extra session of Congress, if the bill is not acted on at this session. There is also the strong probability that the disposal of the tariff and other pending legislation will be allowed to consume so much time that only a short period would in any event be left available for a special session before the new session begins in December. The President has let it be clearly understood, however, that responsibility for the delays rests squarely upon the heads of Congress.

ATTITUDE OF THE MIDDLE WEST

The legislative situation in the Senate is advanced as the principal reason for postponing the subject but it is also obvious that senators from the middle west are still somewhat sceptical as to the popularity of the bill and are therefore afraid of it before election, especially since it has been complicated by the controversy regarding liquor selling on board American ships. The weekly bulletin of the National Merchant Marine Association points out, however, that "The argument is still advanced by the advocates of delay that the interior is opposed to aid to the merchant marine, but nothing tangible is produced to back up the claim. It is still true that not one commercial organization in the United States has gone on record as against the shipping bill while hundreds have come out in advocacy of it. The sentiment of the press is growing stronger, a number of papers that have not hitherto taken a stand either way have declared editorially for the proposed legislation, and some that have been against the measure are now for it. In the farm press is found the bulk of the opposition but in most every instance the character of the comment on the situation shows that hostility to the bill is based on a misunderstanding of its purposes and effects."

Many representatives of the agricultural interests that have been inclined to oppose the bill are said to have received "a new slant" on it as a result of a meeting at the White House on June 28 at which President Harding explained to a number of representative farm leaders the reasons why he thought the farmer should support the proposed legislation. For two hours the President answered the questions of his guests and he was assured that every effort would be made to make clear the principles of the bill to the farming population.

While all of those present were not willing to admit that they were convinced it was learned that many misunderstandings were cleared up that had previously been the cause of much of the opposition.

A special committee of the National Industrial Traffic

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League, which is regarded as the most representative organization of shippers in their relations with railroads and transportation generally, has made a study of proposed changes in the maritime laws and has recommended to the executive committee of the league that the organization favor the passage of the ship subsidy bill and the repeal of Section 28 of the Jones law.

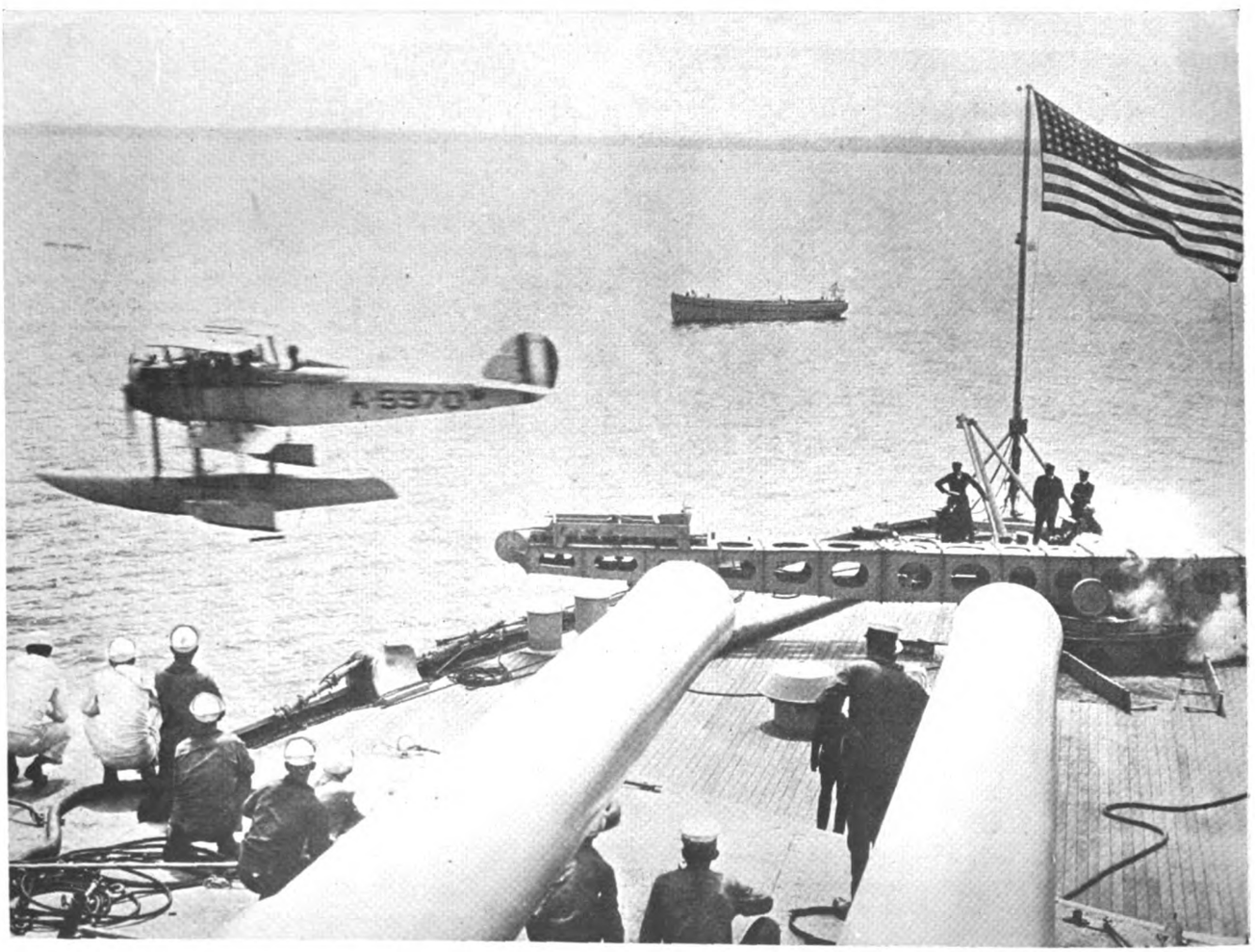
The fact that the Democrats are not prepared to make a party stand against the bill was indicated when the minority report of the House committee on merchant marine and fisheries on the revised bill was filed on June 27. Of the seven Democrats on the committee, only three endorsed the report in full, Representatives Davis of Tennessee, Hardy of Texas and Bankhead of Alabama. Representatives Bland of Virginia and Briggs of Texas signed a postscript to the report stating that they were "substantially in accord with it and opposed to the bill," while Representative Lazaro of Louisiana and Cullen of New York failed to sign the minority report.

Hearing on Liquor Sales

The vexed question as to the legality of sales of liquor on American vessels outside the three-mile limit was given an exhaustive public hearing before Attorney General Daugherty and officials of the Department of Justice on July 13 as the result of a request from the Secretary of the Treasury for an opinion on the subject. Chairman Lasker, not wishing to agitate the subject, had not previously asked for an opinion from the Attorney General but had acted on the advice of his own counsel in the matter. The hearing was on two points, as to whether the eighteenth amendment and the national prohibition act prohibit possession, sale and transportation of intoxicating liquors on American ships on the high seas, and as to whether foreign vessels may bring liquors as ship stores within the three-mile limit. The Shipping Board was not represented at the hearing, although a copy of the opinion of General Counsel Schlesinger was filed. Arguments were made on behalf of the American Ship Owners' Association, the Anti-Saloon League, the Prohibition Bureau and various other organizations.

Bill to Reduce Shipping Board

Senator Borah of Idaho has introduced a bill in the Senate to reduce the number of commissioners of the Shipping Board from seven to three, for the purpose, he explained, of saving four $12,000 a year salaries. One of the effects of the bill would be to break up the present system whereby representation on the board is assured to all sections of the country, the appointments being on a geographical basis. The Borah bill provides that the President should not name more than one commissioner from any state nor more than two from the same political party.



(Photograph by Kadel & Herbert, N. Y.)

Launching a Fighting Seaplane from the U. S. S. Maryland by Means of a Newly Developed Catapult

So successful have the tests demonstrated the launching of a plane from a battleship by a catapult, that each of Uncle Sam's battleships will be provided with fighting planes and a catapult to launch them from her deck. The United States is the sole possessor of this practical plane catapult.

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Recent Developments in Marine Insurance

Barge Canal Pool—Hull Conditions Bad—Suez Canal Recognizes Our Classification—Radio Guides Ships—Oil Burning Recommendations — New English Average Rules — Cuban Conditions

By "Bordereaux"

IN harmony with the popular agitation for a more extensive use of the New York State Barge Canal marine underwriters are co-operating in a movement in conjunction with State officials that should result in attracting traffic through a substantial reduction in insurance rates on hulls and cargoes routed via the canal. The proposition is to form a syndicate of underwriters who will cover on the canal provided the State authorities inaugurate certain improvements and safeguards that should increase efficiency and transform the customary underwriting loss into a perceptible margin of profit. The insurance companies have been regularly losing money on their writings on the barge canal, chiefly because of the large number of strandings in the narrower parts. State Superintendent of Public Works Cadle has been conferring with the underwriters and has expressed a willingness to meet them half way in the improvements suggested by them. These improvements take the form of additional safeguards to navigation; such as buoys, efficient lock approaches and the expansion of wrecking, drydocking and repair facilities. Substantial rate reductions will be granted by the underwriters when these improvements have been made. It is only fair to the insurance men to state that they are as anxious as any other class of New Yorkers to attract shipping to the canal through the practical medium of lower costs.

In this connection it might be added that the underwriters are taking a cordial interest in the plans now being perfected for a line of seventeen motor barges for use in the canal and Great Lakes, by which it is planned to make possible extensive shipping operations between New York and Duluth without breaking bulk. A company is being organized to produce and operate the fleet as soon as additional capital has been subscribed. Theodore D. Wells, a prominent naval architect, is the designer. The American Bureau of Shipping has been asked to class them when completed. Each barge is to have a cargo capacity of one thousand tons, will be of steel, 220 feet in length and with a Diesel electric drive. Seaworthiness is to be the special consideration, for it is proposed not only to use these barges on the Great Lakes during the navigation season but to employ them in the coastwise trade for the remaining four months of the year.

Hull Conditions Bad

ONE of the safest marine insurance authorities of England is Sir Edward Mountain, chairman of the Eagle, Star & British Dominions. In an address to the stockholders of that company he recently declared that hull conditions in general continue to be extremely unsatisfactory and that claims for repairs, directly or indirectly, absorb the majority of the premiums. Under the old Hull Agreement the companies had enjoyed a reasonable average profit, but when that went to pieces last year disaster set in. Increasing competition and the reduction in values induced certain underwriters to withdraw at that time and the combination could not be longer maintained. After a year of wide open competition the full extent of their folly may now be measured. Premium receipts have gone off from forty to fifty percent, taking into consideration the reduced values on which the steamers were placed.

"In my opinion," said Sir Edward, "such a reduction was absolutely unwarrantable and could hold no prospect whatever of profit, but only a certain loss; in consequence of which, much to our regret, we refused to renew the bulk of this business, even although by so doing we gave up connections we had had for a great number of years."

Suez Recognizes Our Classification

IT has been a great satisfaction to American underwriters, as doubtless to all others of their countrymen, to have the authority of the American Bureau of Shipping accepted by the Suez Canal Company. Not but that it ought to be recognized as well there as elsewhere, but because considerable serious trouble has been obviated by the Suez authorities granting a belated inclusion of our national classification society among those of other countries. It will be remembered that the Merchant Marine Act of 1920 made the Bureau the official classification society of the United States. What, then, was the amazement of our underwriters and shipping interests to learn that the recently promulgated order of the Suez Canal Company ignored the Bureau altogether in its designation of classifications under which tank steamers carrying bulk oil and gasoline would be allowed to make use of that important waterway. That order included only Lloyds, the Bureau Veritas, German Lloyds and the British Corporation of Glasgow, as classification societies under which that type of vessels passing through the canal could be certified. It is estimated that, had this order stood, it would have denied the canal to more than 900,000 tons of American vessels, including those of the United States Navy. As good luck would have it, Stevenson Taylor, president of the American Bureau of Shipping, was at the time in Europe on a visit of inspection of the society's Continental agencies and he was promptly cabled the news and at once got in touch with the Suez authorities and had the assurance given him that the order would be instantly corrected to include the Bureau. It was declared to have been an oversight. Classification is required of tank ships in order to make sure that certain technical details of construction have been complied with so that accidents may not happen that would possibly block the waterway.

Radio to Guide Ships

MARINE underwriters are taking the liveliest interest in the announcement of Signor Marconi that radio can be utilized to guide vessels in fog and storms. The great inventor made such conclusive demonstrations of the possibilities of the short wave, in his recent address before the American Institute of Radio Engineers, that insurance men are confident that it is only a question of a few more developments before this great agency of protection will become commercially available. The time has passed when anyone questions the conclusions of the inventor of wireless. Signor Marconi illustrated his points by the use of a toy apparatus that sent across a space of twenty feet. He said that the possibilities of the short wave have been universally neglected but that they are capable of as high a development as the long distance waves of

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hundreds and thousands of meters in length. He demonstrated that a shaft of radio waves might be reflected in any desired direction, as light from a mirror, and that in this manner a lighthouse could guide a ship through a dangerous channel in fogs and storms. With waves of three and a half meters he has reflected radio signals six miles and waves of fifteen meters have been reflected for ninety-nine miles.

New English Average Rules

AT the recent annual meeting of the English Association of Average Adjusters a new rule of practice was adopted with respect to the contributory liability in general average of ships' stores, bunker coal or fuel. It is as follows:

That underwriters insuring ships' stores, bunker coal or fuel, destroyed or used as part of a general average operation, shall be only liable for those articles as a direct claim on the policy when they formed part of the property at risk at the time of the peril giving rise to the General Average Act.

Adoption was also accorded the following probationary rule:

That in practice, for the purpose of ascertaining the liability of underwriters for contribution to general average and salvage, deduction shall be made from the insured value of all losses and charges which constitute a deduction from the contributing value and for which the insurer is liable.

Oil Burning Recommendations

ONE of the important points recommended in the report of the Marine Fire Hazards Committee, recently adopted by the National Fire Prevention Association, has to do with oil burning equipment on vessels. It reads as follows:

It is strongly recommended that systems whereby oil is pumped from the tanks to the burners be used; but in cases where a pumping system is deemed impracticable and the use of gravity feed is desired, special permission shall be granted installation and detailed plans submitted and approved.

Pumps shall be in duplicate, of an approved design, well secured against leaks under a test pressure 50 percent in excess of the designed pressure of the system carried.

Whether pumps are located inside or outside of the fireroom, gear shall be installed for operation from deck of stop valves on each tank and throttle valves on both service and booster pumps. This provision does not apply to fuel pumps on motor vessels.

On steam vessels burning oil of a flash point lower than 150 degrees F., closed cup, the pumps handling such oil shall be located in a compartment separated from the rest of the machinery space by gas-tight bulkheads and accessible therefrom only by a gas-tight door.

The piping and spindles of fireroom controls shall be made gas-tight where they pass through the pump room bulkheads.

This pump room shall be provided with induced ventilation always sufficient to reduce the pressure therein slightly below that in the compartment from which entry is made.

Cuban Conditions

ALTHOUGH port conditions at Havana are greatly improved and shipments are now passing through the Custom House and being removed by consignees within five days after the arrival of vessels, there still remain many sensational evidences of the astonishing congestion that prevailed there a year ago and these continue to disturb economic conditions. Forty-nine warehouses contain more or less of them and this merchandise appears to be without owners and will eventually be sold at auction by the Cuban authorities for the payment of fees and other charges that have accumulated upon them. It is being asked, "What is to become of these goods before the Cuban Government disposes of them and what is to be the position of the marine underwriters in the controversy?"

Albert R. Lee, E. A. Palmer and Mr. Amberg, counsel, of the admiralty firm of Harrington, Bigham & Englar, compose the group that is negotiating in Cuba on behalf of the underwriters. They have found a very complete pilfering of cases of merchandise of every description. Worthless rubbish of a weight rudely approximating the former heft of the goods filled the cases and sometimes there was nothing at all in them. It is not believed that the responsibility for these losses will fall upon the underwriters but rather upon either the shippers or the consignees, as the facts shall develop upon legal inquiry. It appears that many stevedores and dock workmen whose wages came to them at uncertain intervals tided their financial necessities over by helping themselves to such merchandise as appealed to their fancy. In one instance a shipper called in an authority to advise him as to his position. He had shipped forty-three cases of goods to Cuba a year ago and only recently took steps to re-ship the merchandise back to the United States. He found forty-one of his cases absolutely empty and the other two partially pilfered.

One of the chief sources of loss to Americans has been the notoriously inefficient packing they employed. Such inherent defects were found to obtain much more frequently with American shipments than with those that had come from Europe.

English Insurance Conditions

ADVICES from the United Kingdom and the first-hand observations made there by recently returned visitors from the United States all tend to show the same slackness of the marine insurance market that has given so many of our own underwriters anxious hours these many months past. The underwriting room at Lloyds is said to be only sparsely populated nowadays and many of the leading company officials find little occasion to run up to town. Next to nothing is being written and what is placed is at rates absurdly low. It has been discovered that the brokers, both in the British Isles and in America, have been decidedly more alert than the underwriters and have secured acceptances at rates much lower than conditions justified. Only now the insurers are awaking to the situation and are beginning to demand something more equitable in rates. The tendency from now on is said to be decidedly in the direction of better quotations. It is also of interest to learn that the British underwriters have been realizing a nice profit upon their American business. Hull rates have been so low, and the valuations so enormously reduced, that many of the more astute underwriters are declining to accept further business at prevailing figures and prefer to let business go, even though it has been on their books for years, rather than face a certain loss with no possible hope of profit. Raiding of rival office accounts continues there, as here, to be the leading summer pastime. Now and again a prominent company is found announcing that it has decided to abandon direct writing altogether for the time being. Certainly, few men in marine insurance today have ever known the market to be so slack or so replete with discouraging conditions.

Would Insure a Ship's Life

CERTAINLY the Germans are nothing, if not ingenious. A group of savants of that country is engaged upon a scheme for the application of life insurance principles to such inanimate objects as ships and houses, and several companies have been formed at Berlin and Hamburg for the effecting of this class of protection.

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Simplification—Has It a Place in Shipbuilding?

By N. C. Wiley

The urgency of the need for reducing American shipbuilding costs needs no elaboration and the following is a suggestion of the possibilities of a new and untried step in this direction.

STANDARDIZATION is a term which, when applied to shipbuilding, has entirely different meanings for different persons and therefore the term as used in this article must be defined. Standardization, as used herein, means the development, by a shipbuilder or by the industry as a whole, of a standard line of fittings or ship parts. It is far from the writer's intention to urge standard design of ships and yet this is the construction frequently given the term. As yet standardization, although practiced to a greater or less extent in all shipyards, has not been unified by either builders or owners. No successful or thorough attempt at such standardization has been made by any large group or organization.

Simplification is a development of standardization by elimination which can best be defined by examples. If a line of cleats is designed in ten sizes for one type, six sizes of a second type and three sizes of a third, and these cleats do away with the necessity of further cleat design whenever a new ship is built, standardization has been attained. Now, if the first type can be reduced to five sizes, the second to three, the third eliminated and still all necessary requirements met, we have simplification.

> *"We have probably the highest ingenuity and efficiency in the operation of our individual industries of any nation. Yet our industrial machine is far from perfect. The waste of unemployment during depression; from speculation and overproduction in booms; from labor turnover; from labor conflicts; from failure of transportation, fuel and power supplies; from excessive seasonal operation; from lack of standardization; from loss in our processes and materials—all combine to represent a huge deduction from the goods and services that we might all enjoy, if we could do a better job of it.*
>
> *"One hundred percent is never possible in the material world, but the primary duty of organized society is to enlarge the lives and increase the standards of living of all the people, not of any special class whatever. The opportunity for advance in living standards lies more surely in the steady elimination of these wastes than in great inventions."*
>
> —HERBERT HOOVER.

If patterns are made for valves in cast iron, cast steel and composition for high, medium and low pressures in angle, globe and cross types in sizes at every half inch from ½ inch to 6 inches, then at every inch to 12 inches, there would be 286 valves and standardization would be nearly attained. If by combination, elimination, compromise and agreement this line can be reduced to sixty varieties, that is simplification. If the same yoke is used for a certain six of the valves instead of two yokes for the six, that is further simplification.

Simplification is the final step in standardization and it is that step in which lies the most economy. It is only simplified standardization that will effect a material reduction in costs. Yet it is this final step that is the hardest to take, requiring the most co-operation, thought, patience and foresight.

Satisfactory Solution Possible

Everyone who has to do with ship fittings tries to standardize and to simplify but meets with so many difficulties that the result is far short of perfection and by individual effort no satisfactory and abiding solution is possible. This situation is not caused by any lack of skill or interest on the part of shipbuilders' technical staffs. To establish a complete standardized line of both hull and engine fittings would take time and concentration on the part of experienced men, but there would be nothing impossible about it. The failure has been due to the fact that operators, marine superintendents, port engineers and inspectors have not adopted the same standards and refuse to recognize the builders. This refusal may be justified, as it is obviously possible that so-called standards may be poorly designed and not of a quality to give satisfaction. At times, however, it seems a mere matter of upholding a difference of opinion or of improperly written specifications.

The difficulty was aggravated by the boom of two years ago, but has always existed. The necessity of a solution is more acute in the reaction of today than ever before in the checkered history of the American merchant marine. For operators to maintain a technical staff large enough to criticize and check the plans of every detail of construction and to incorporate in the specifications a detailed description of all systems and individual fittings is at present often considered necessary. This is a burden to the owner in office overhead, in expense passed on to the owner by the builder, in delayed completion, disputes and in diversion of the staff from a more important duty—inspection of workmanship. The expense and folly of submitting detail plans for approval are not fully realized by the average operator. He is a business man with no time to verify the assurance given him that a satisfactory ship can not be obtained in any other manner.

Typical Examples

Before the war, a company building two ships specified and insisted on having rigging screws several sizes larger than the builder had hitherto used on the given sizes of rope. Furthermore, the rope was iron and of less strength than steel rope of the same size. Comparisons with manufacturers' quoted strengths, builders' and navy standards, classification requirements, mathematical analysis, all were of no avail; the representative's experience taught him that the specified sizes were necessary. If this were so, ships are in service with rigging screws which are too small.

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Ships for two owners were being built from the same plans. The naval architect for the smaller fleet must have the male and female sockets on his goosenecks and gooseneck bolts reversed from the builders' patterns and the other owner's standard practice. Only recently, and on a rush job, specifications for a flanged copper pipe steam heating system were issued for alterations to one of a large class of ships now fitted with steel pipe and screwed fittings. Neither flanges, tees, laterals nor valves for this purpose were obtainable, with the result that steam heating was the point about which contract delivery was made to hinge. The point here is not so much the relative merits of steel and copper as that a system should be asked on a rush job which was so unusual that neither manufacturers nor a large shipbuilder were in a position to supply the fittings. If such a revolutionary change is desirable, should it not be first the subject of general discussion and mutual agreement?

Only in June a plant which had tried for a month to obtain a 4½-inch high pressure cast steel cross valve had to make one because of the existence of 4½-inch lines in a ship being reconditioned.

The above are just samples taken from the inexhaustible list of cases where simplification has been prevented. It is largely due to the lack of a universally recognized and agreed upon standard of size and type. It has seemed in the past to those actively engaged in the design and ordering of ship fittings that there was no way out of this dilemma. Happily, this is no longer the case. The way out lies in following a path already being blazed by many other industries, many of which are on the verge of a period of prosperity, while shipping is not.

Department of Commerce Interested

The shipping industry, in common with others, can now obtain the assistance of a new government agency as an aid in their solution—an agency started and actively supported by Mr. Herbert C. Hoover. The Bureau of Simplification of the Department of Commerce is referred to. The activities of this organization are increasing in their scope daily and are best described in the words* of Mr. W. A. Durgin, the director:

"The first step is to arrange for securing statistics, or other data, which shall show present conditions and indicate the line for action. For the machinery interests, the representative trade associations would appoint a small contact committee to get in touch with Secretary Hoover and the Division of Simplified Practice. After a conference at Washington, this committee would proceed to survey the machinery field for the Department of Commerce getting figures showing varieties manufactured and the importance of the several items during the last few years. The committee would summarize these data in a report covering present conditions, and would then forward the summary to the Division of Simplified Practice. With this report before it, the division would prepare a tentative list of representatives to the general conference—the personnel of the list being submitted to all trade associations interested and to the United States Chamber of Commerce, the American Engineering Standards Committee and other bodies, to insure that every factor in the field was given proper voice. All the representatives included in the final amplified list would then be invited to a conference in Washington and this conference would proceed to work out such recommendations for simplification as the general discussion should develop. The conference would further decide how frequently similar conferences for revision of the recommendations should be called; and each representative would engage to obtain the approval of his association, firm or other parent body, to the recommendations as finally adopted. Finally, the Division of Simplified Practice, for the Government, would give national standing and publicity to the action of the conference by issuing the recommendation as one of its official series. This series will be numbered in sequence and will be known as 'Simplified Practice Recommendations of the Department of Commerce.' As a part of its service the division will obtain a formal letter of acceptance of the recommendation from each of the bodies represented at the conference and, when necessary, from the individual members of those associations most interested. At regular intervals statistics from all manufacturers and distributors as to the percentage of business done in the simplified sizes will be requested and the division will accumulate data on necessary revision, calling the conferences for such revision at the times originally set by the industry."

*From *The American Machinist*, May 11, 1922.

It is surprising, that, in spite of the lessons taught by the lack of this very program in 1917 and 1918 and notwithstanding Mr. Hoover's well known interest in the American merchant marine as a necessary component of our foreign and domestic commerce, no shipping interest has as yet approached the Bureau of Simplification. In June the writer was assured that he was the first person to bring the subject to their attention. He was only a few minutes ahead of the beehive manufacturers and they were prepared to call a conference at once.

However, without either owners or builders taking any initiative, future ships are sure to undergo a great deal of simplification, although not enough. It is impossible to have conferences on simplification among the trade and manufacturers' associations of almost every conceivable material and article entering into the equipment and outfit of a ship and not have the effect apparent. Consider the following partial list of industries which have entered this campaign, some of them making their first move in May of this year, others being well advanced:

Asbestos products	Hardware
Automotive equipment	Instruments, electrical
Boilers, steam	Linoleum
Boxes and barrels	Cotton duck
Cordage and twines	Machine tools
Fabricated structural steel	Paint
Gas engines (inc. marine)	Plumbing
Refrigerating machinery	

By the time this article is published many other lines upon which shipbuilding is dependent will be reducing dimensional and color variation in their product.

What advantages will accrue alike to owners and shipbuilders? Some of them would seem to be:

1. Reduced cost of new and repair work due to savings in:
   (a) Design of details
   (b) Patterns, jigs, etc.
   (c) Unusable surplus material
   (d) Economy through quantity production
   (e) Idle equipment
   (f) Discontent among yard and office workers
   (g) Storeroom expense
   (h) Delays
   (j) Accounting
   (k) Estimating
   (l) Purchasing expense
   (m) Administrative expense.

The above are in addition to the savings made in the price, delivery and handling of purchased parts already undergoing simplification as previously noted.

2. Greater speed in both new and repair work.
3. More accurate and dependable workmanship and design.
4. Less expense to owners on account of technical staff having—
   (a) Simpler specifications
   (b) Less checking of detail plans
   (c) Less correspondence
   (d) Less overhead
5. Increased effectiveness and decreased cost of inspection.
6. Decreased expense in and increased possibilities of adapting purchased or leased ships to new operators' requirements.

There is no time like the present for the numerous organizations of owners, operators, builders and designers to let Mr. Hoover know that they are as alive to the opportunity now open to American industry as are other and allied trades. Once started, no harm and much good will result and lasting benefits accrue to all participants. It is as practical a form of subsidy as any that has been suggested!

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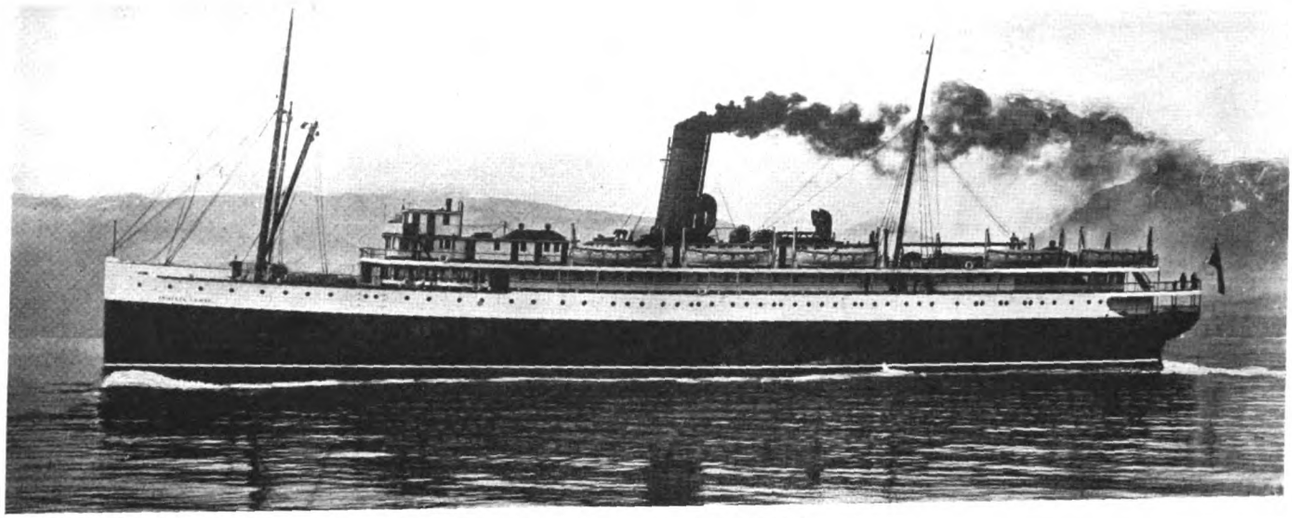

S. S. Princess Louise on Trial

Canadian Pacific Coastwise Steamer Princess Louise

Luxuriously Equipped Passenger Ship for Coastwise Service of Canadian Pacific Railway Built and Engined by Canadian Shipbuilder

By R. Allan, B. Sc.,* and A. F. Menzies, M. I. N. A.†

THE recent addition of the palatial steamer *Princess Louise* to the coastwise fleet of the Canadian Pacific Railway Company draws attention to a very significant epoch in the history of Canadian shipbuilding. Previous to the war, no Canadian shipyard could have competed with any hope of success against the old-established yards of Great Britain; but the war upset all standards of economic values, raising the cost of shipbuilding in the old country to heights hitherto undreamed of. Hence when it was announced about eighteen months ago that the Wallace Shipbuilding and Dry Dock Company, Ltd., of North Vancouver, B. C., had booked the contract for this noteworthy vessel, it was obvious that the Canadian bid was strictly in accordance with prices received from the Clyde and Tyne.

In view of the fact that previous outstanding vessels of the Canadian-Pacific coastwise fleet had been built by such well known shipbuilders in Great Britain as the Fairfield Shipbuilding and Engineering Company, Ltd., Govan, Glasgow; Swan, Hunter and Wigham Richardson, Ltd., Newcastle-on-Tyne, and Bow, McLachlan and Company, Ltd., Paisley, Scotland, it was not surprising that skeptics marveled at the audacity of the owners in placing this contract with a relatively small shipyard. In Mr. Wallace, however, who is the active head of the Wallace Shipbuilding and Dry Dock Company, Ltd., Canada possesses a shipbuilder of the type of the Dennys, of the Lairds and other historic names of British shipbuilding. For nearly thirty years Mr. Wallace has been building ships in Vancouver, including fishing boats, fine stern wheelers for the lakes, tugs, ferries and more recently freight steamers such as the 8,350-ton *Canadian Highlander* and *Canadian Skirmisher*. Moreover, the workmen at the Wallace shipyard are in nearly every case trained shipbuilders, mainly products of the Clyde, Belfast and the Tyne. The results accomplished by such an organization can be seen in the successful completion of the vessel itself, which in beauty of design, luxury of equipment, decorative effect and all around excellence competent critics consider superior to anything in the fleet.

* General superintendent, Wallace Shipbuilding and Dry Dock Company, Ltd., North Vancouver, B. C.
† Chief engineer, Wallace Shipbuilding and Dry Dock Company.

Main Particulars of the Vessel

The principal dimensions of the *Princess Louise,* which has been built under British Corporation rules to their highest class for sea-going vessels, are as follows:

Length overall	330 feet 0 inches
Length between perpendiculars	317 feet 0 inches
Beam, molded	48 feet 0 inches
Depth, molded	27 feet 6 inches
Draft forward	15 feet 0 inches
Draft aft	17 feet 0 inches
Mean draft	16 feet 0 inches

In the design of the vessel and its accommodations primary consideration was given to the Alaska run, but what are known as the triangular and local runs, viz., Victoria, Seattle and Vancouver, and Victoria-Vancouver, had also to be considered, more especially as regards fineness of form, necessitating a very fine block coefficient to maintain with economy the speed of the triangle run, viz., 16½ knots.

Nothing that pertains to the comfort and pleasure of the passengers usually provided on ocean liners has been omitted. Indeed the vessel, with her smoking rooms, dining saloons, observation room, library, suites de luxe, etc., can best be described as an ocean liner in miniature.

Owing to her fineness the vessel will carry only about 700 tons of cargo but her main deck forward has been provided with very large cargo ports, capable of allowing a large limousine to embark without having to take off the top hamper. Altogether this deck can hold about forty cars.

To facilitate the handling of freight, a freight elevator has also been installed forward on this deck. Aft on the orlop deck a cold storage compartment of about one carload capacity has also been provided, in addition to the usual cold chambers for the ship's provisions.

A very complete installation of cargo handling gear has

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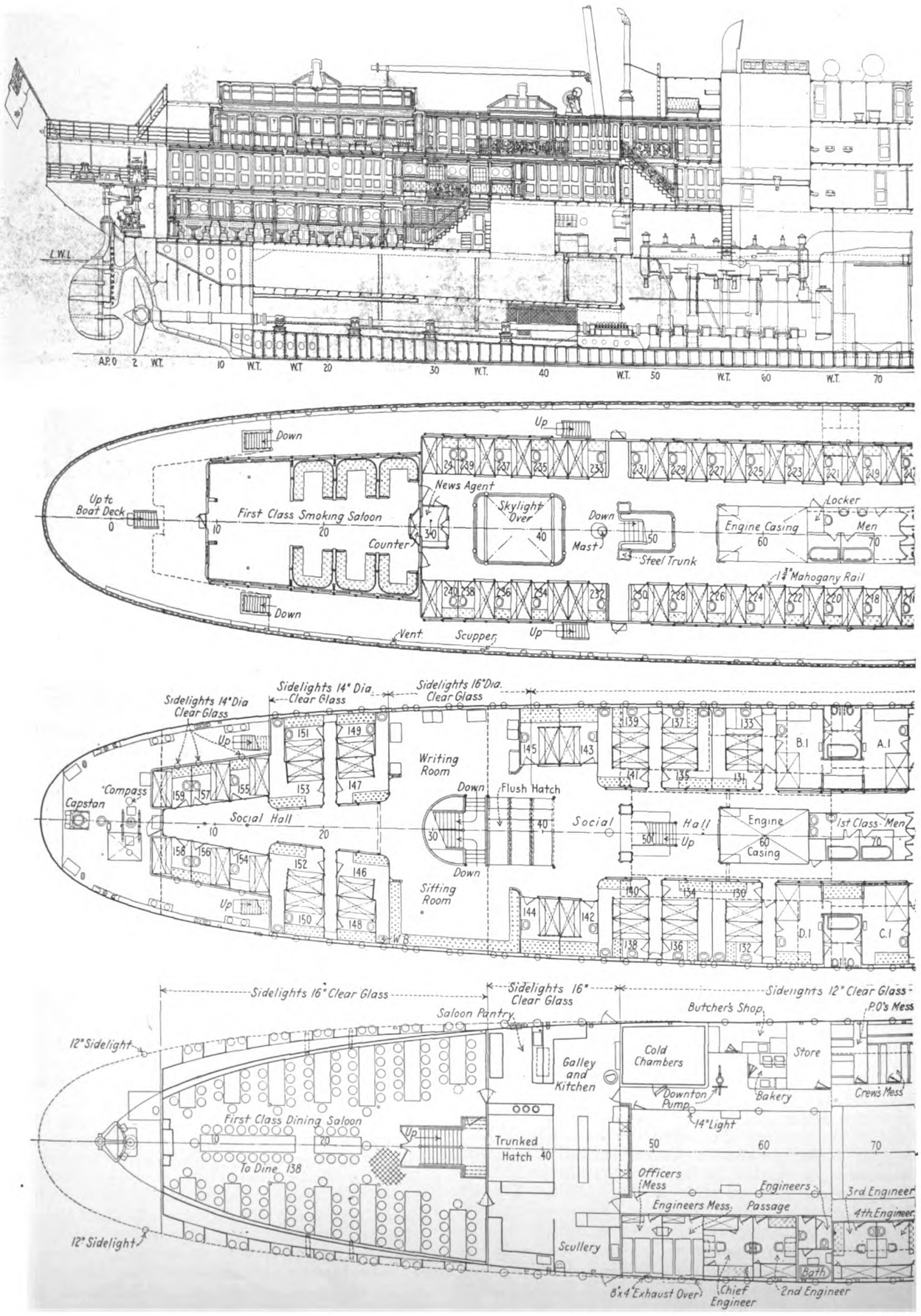

Profile and Deck Plans of Canadian-Pacific

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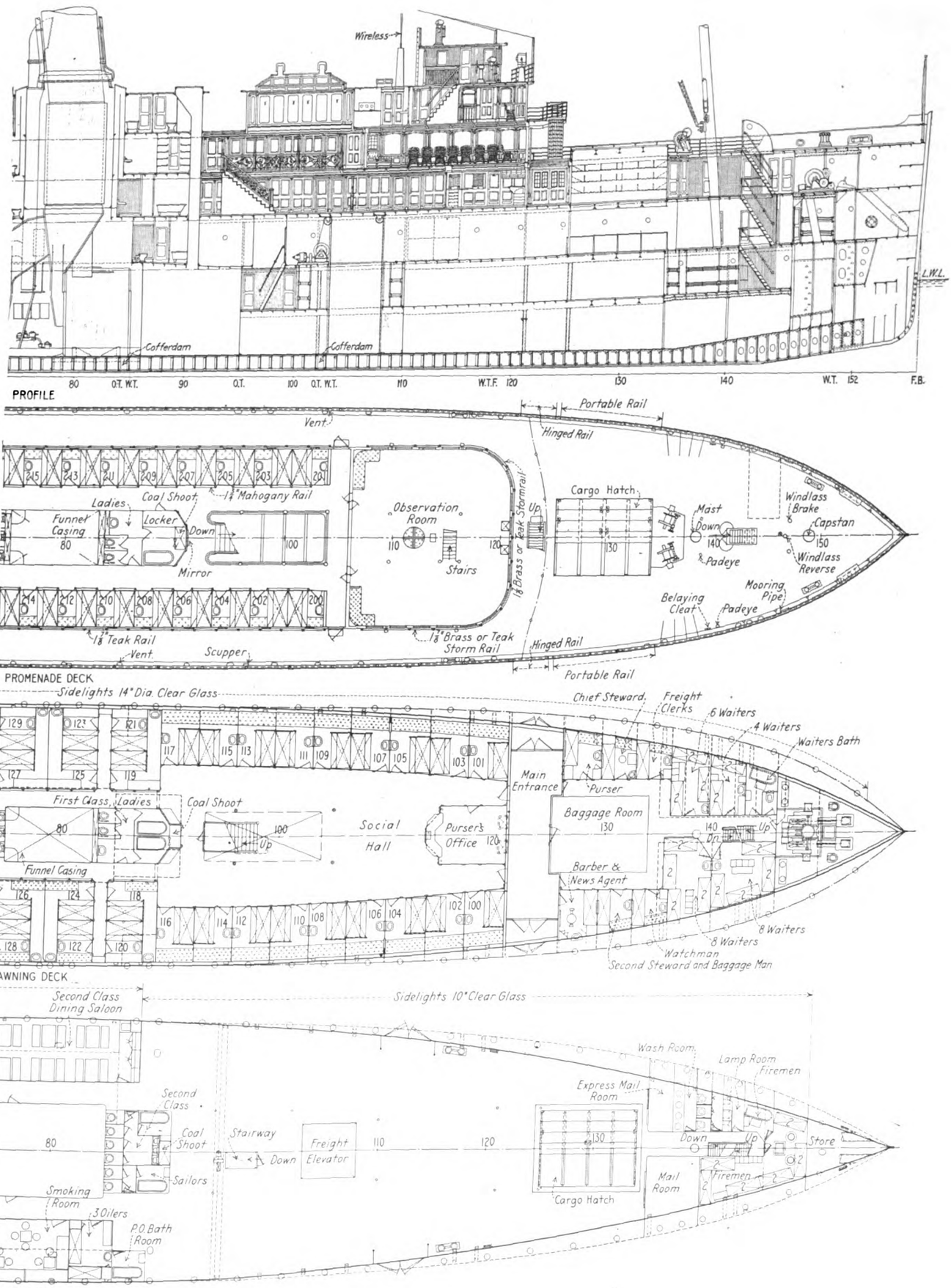

Coastwise Passenger Steamer Princess Louise

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RIVETING SCHEDULE

KEEL Treble Riveted Butts for ½ L. Double Riveted at Ends. Rivets Spaced 3½ Diameters
Double Riveted Seams, all Fore and Aft, Spaced 4½ Diameters

CENTRE GIRDER Double Riveted Butts all Fore and Aft Spaced 4½ Diameters
Bottom Angles where Single, 5 Diameters
" " " Double 5½ "
Top " " under Engines 5½ "
" " Elsewhere 7 "
Vertical " 5"x5" 7 " In each row
" " 3"x3" 5 "

DOUBLE BOTTOM Frames and Reverse Angles to Floors Spaced 7 Diameters
" " " " in E.Space " 5½ "
" " " " at Tank Ends " 4½ "
" " to Shell Plating in way of Fuel Oil Spaced 2¾ c/c
Reverse Angles to Tank Top Plating Spaced 7 Dias.
" " " " in E.S. " 5½ "
" " " " in way of Oil Tanks Spaced 2¾ c/c
Vertical Angles of Intercostals and Side Girders Spaced 7 Dias.
Horizontal Angles to Tank Top and Shell Spaced 8 Dias. 5½ Dias. under Engines
Brackets on Open Floors Spaced 5 Dias.
Tank Margin Angles Spaced 5 Dias.
" " " in way of Oil Fuel Spaced 2¾ c/c

MAIN FRAMES To Shell Plating Spaced 7 Diameters
In After Peak " 5½ "
In Oil Fuel Tanks " 5½ "
Fore Peak for 41 feet Abaft Stem from Keel to Well above Load Line Spaced 5½ Dias.

TANK TOP Centre Strake - Double Riveted Butts all Fore and Aft Spacing 4½ Dias. ⓓ 4½ Dias. at Ends } Butts 2¾ ⓓ Oil Tanks
Margin Plate " " Seams for ½ L. Single at Ends Spaced 4½ Dias.
" " Butts all Fore and Aft. Seams Single Riveted Except in way of Oil Fuel Tanks where it is Double Riveted. Spacing 4½ Diameters except in way of Oil Fuel Tanks where it is 2¾ c/c
Plating Double Riveted Butts for ½ L. Single at Ends
Seams Single Riveted except in way of Oil Fuel Tanks which are Double Riveted
Spacing 4½ Diameters except in way of Oil Fuel Tanks where it is 2¾ c/c

SHELL PLATING Strakes A, B, C, D, E, F, G and H. Double Riveted Seams all Fore and Aft Spaced 4½ Diameters except in way of Oil Fuel where Spacing is 2¾ c/c } Butts Treble to Double
Strakes J, K, L and M Single Riveted Seams, all Fore and Aft Spaced 4½ Diameters

DECK PLATING Awning Deck (Upper or Strength Deck) Stringer - Double Riveted Butts all Fore and Aft Spaced 4 Diameters. Plating - Double Riveted Butts for ½ L. Single at Ends spaced 4 Diameters. Single Riveted Seams Spaced 4½ Diameters
Orlop, Main and Promenade Decks :- Stringers - Double Riveted Butts, all Fore and Aft Spaced 4 Dias
Orlop and Main Deck :- Plating - Double Riveted Butts for ½ L, Single at Ends Spaced 4 Dias.
Single Riveted Seams, Spaced 4½ Diameters where Caulked. 5½ Diameters elsewhere
Double Riveted Seams at Crown of Oil Fuel Tanks Spaced 2¾ c/c
Promenade Deck Plating - Single Riveted Seams Spaced 5½ Diameters
All Deck Beams to Plating - Spaced 7 Diameters

ATTACHMENTS :- Beam Knees and Brackets, 5 Diameters Single, 7 Diameters Zig-Zag

DECK GIRDERS :- Double Riveted Butts Spaced 4½ Diameters
Deck Lugs Spaced 6 Diameters

BULKHEADS :- Frames to Shell 5 Dias. Boundary Angles to Deck Plating and Tank Top Spaced 4½ Dias.
Single Riveted Seams and Butts Spaced 4½ Diameters
Stiffeners, Ordinary Bulkheads Spaced 7 Diameters
" in Peaks " 5½ "
The Spacing of Rivets on all Bulkhead Stiffeners to be 4 Diameters for 15 per cent of their Length at each end

GUNWALE ANGLE :- At Awning Deck Spaced 4½ Diameters

STRINGER ANGLES AND SHELL LUGS :- Spaced 5½ Diameters

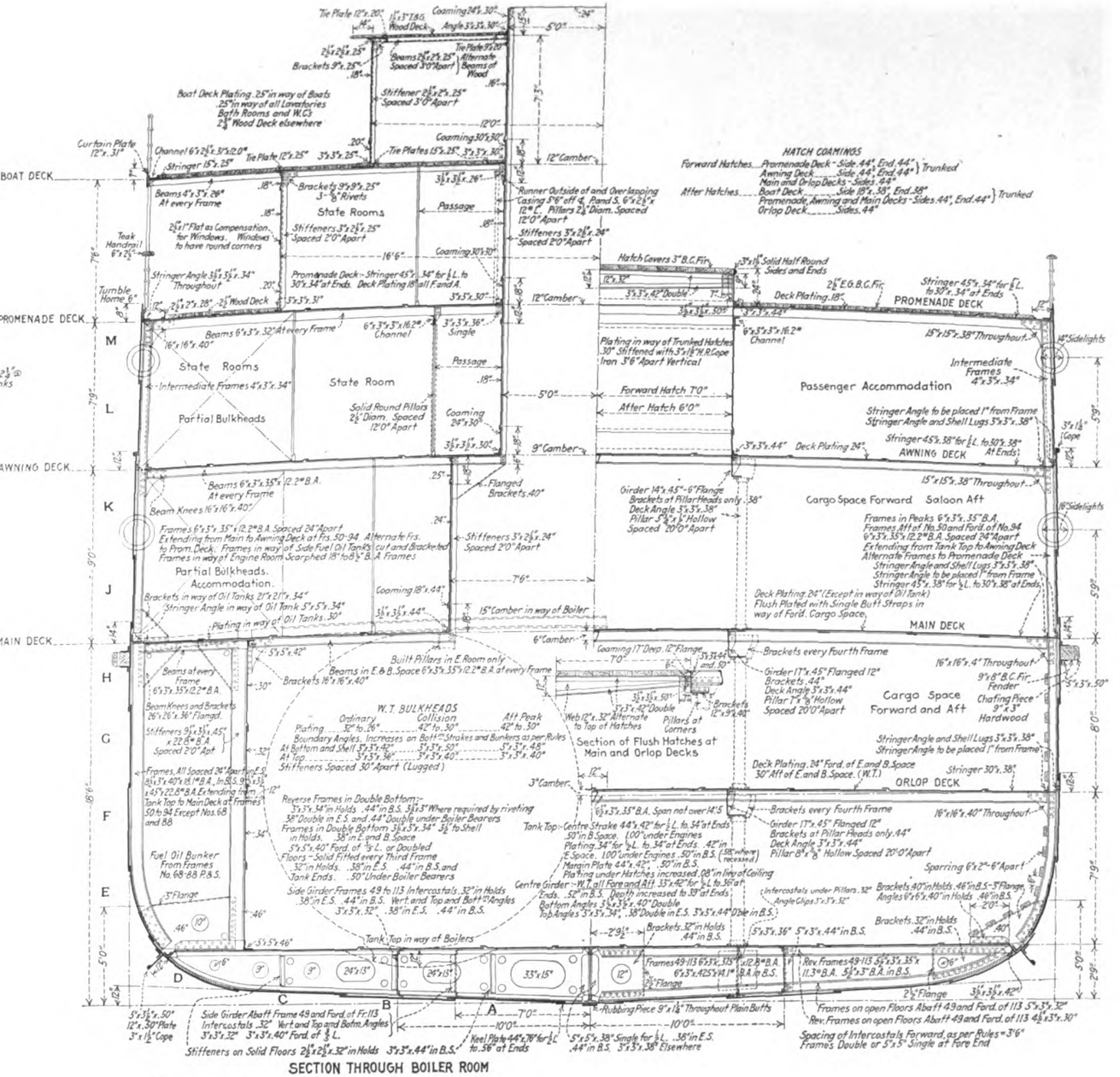
CASINGS :- Butts of Coaming (where exposed to weather) Spaced 4½ Diameters
" " " (" not " " ") " 6 "
Seams " 6 "
Angles to Deck Plating (not exposed to weather) " 5½ "
" " " " (where " " ") " 4½ "
Stiffeners " 8 "

SHELL PLATING

Overlapped	Strake "M"	.34"	for ½ L. to .30" at Ends
	" L	.34"	" " .34" at Ends
	" K	.46"	" " "
	" J	.46"	" " .38" at Ends
	" H	.48"	" " "
	" G	.48"	" " "
	" F	.48"	" " "
	" E	.48"	" " "
	" D	.50"	" " "
	" C	.50"	" " "
	" B	.50"	" to .54" Ford. and .38" Aft
	" A	.50"	" to .54" Ford. of ½ L. .38" at Aft End

Bass Plating .38"
Strakes "E and F" for 50 feet Abaft Stem Fitted with Doublings .44" - .38" (Owner's Extra)

STEM - 8"x 2¾" Rolled Steel



SECTION THROUGH BOILER ROOM

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Canadian Pacific Coastwise Steamer Princess Louise

General Information

Service: British Columbia Coast Service.

Builder: Wallace Shipbuilding and Drydock Co., Ltd., North Vancouver, B. C.

Owner: Canadian Pacific Railway Co.

Characteristics

Length, overall	330′ 0″
Length, B. P.	317′ 0″
Breadth, molded	48′ 0″
Depth molded to main deck	18′ 6″
Draft, loaded	16′ 1¼″
Draft, light	
Block coefficient	
Midship section coefficient	
Longitudinal coefficient	
Speed, loaded, knots	17
Cruising radius, nautical miles	2,000
Framing	Transverse
Class	B. S.* with free board

Tonnages

(In tons of 2,240 pounds)

*Weight of Hull	
**Weight Propelling Machinery	
Deadweight Capacity..	Grain 90,870 cu. ft. / Bale 79,720 cu. ft.
Displacement	

(In tons of 100 cubic feet)

Gross register	4031.91
Net register	1583.26

*Weight of Hull includes Hull Proper, Hull Fittings, Equipment and Outfit.

**Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers and Machinery Space Auxiliaries.

Canal Ratings

(In tons of 100 cubic feet)

	Gross	Net
Suez		
Panama		

Equipment

Anchors:

2 Bower, each 50 cwt. stockless
1 Spare Bower, 42½ cwt. stockless
1 Stream, 15 cwt., ex-stock
1 Kedge, 6 cwt., ex-stock

Chain:

270 Fat., 2″ stud link
90 Fat. 4½″ S. W. stream line
120 Fat. 4¼″ S. W. towline
2 Hawsers, 90 Fat., 7″ manila
2 Warps, 90 Fat., 6″ manila

Rudder

Area	91.5
Dia. Stock	10½″
C. Press. abaft C. L. pintles	

Complement

Deck officers	5
Deck crew	22
Engineer officers	4
Engineer crew	15
Purser's and steward's department	44
Total officers and crew	90
First-class passengers	300
Second-class passengers	44
Third-class passengers	10
Total passengers	354
Total complement	444

Handling Equipment

	No.	Type	Capacity	Length
Masts	2	Steel	....	....
Derrick posts.	....	....	....	....
Booms	4	Wood	5 Ton	34 ft.
	1	Steel	15 Ton	45 ft.

Deck Machinery

(Number, Size, Type)

Steering Gear, 1 ..... 8″x8″ Hastie
Windlass, 1 .... 9½″x11″ Emerson Walker
Capstans, 1 aft..... 6″x8″ Emerson Walker
Winches, 4 ..... 7″x10″ Vert. Osc. Victoria Machy. Dept.

Life Saving Equipment

Lifeboats	No.	Type	Length
Lifeboats	10	Wood	24 ft.
Lifeboats	1	Wood	21 ft.

Propelling Machinery

Boilers

Number	4
Type	Single-ended Scotch
Length	12′ 0″
Diameter	16′ 0″
Furnaces	12-48″
Fuel	Oil
Draft	Natural and closed stokehold
Total heating surface, square feet	13,364
Total grate surface or furnace volume	
Superheat, degrees F	
Working pressure, lbs. per sq. in.	180
Normal fuel consumption:	
Per day, tons	
Per horsepower hour, pounds	
Normal steam production:	
Per hour per pound of fuel	lbs.
Total per hour	lbs.

Engines

Number	1
Type	4 Cyl. Trip. Exp.
Size	28″x43″x50″x50″—39″ stroke
Horsepower	3,678 at 136 R. P. M.

Propellers

Number	1
Type	4 Bladed
Weight	
Diameter	
Pitch	
R. P. M.	140
Projected area	
Developed area	

Auxiliary Machinery

(Number, Size, Type)

Machinery Space

Condensers ..... 1 steel plate, 5,700 sq. ft.
Evaporators
Distiller
Filters
Feed water heater ..... Weiss, exhaust
Fuel oil heaters, 4 ..... Dahl

Pumps:

2 Main feed, 13½x10x21
1 Air, 12x22x15 dual
1 Aux. feed, 10x6x10 duplex
1 Fire, 10x6x10 duplex
1 Ballast, 6x7x7 duplex
2 Bilge and San., 6x6x6 duplex
1 Hot F. W., 4x2¾x5 duplex
1 Cold F. W., 4x4x5 duplex
1 15″ cent. circulating

Refrigerating Machinery

Peterbrotherhood, CO.

Electric Equipment

Generators, 2 ..... W. H. Allen 63 K. W.
Radio
Emergency

Holds

No.	Length	Hatches
1 Cargo	72′-0″	18′x14′
2 Cargo	30′-0″	10′x10′
(Freight Elevator)		
1 Orlop	72′-0″	18′x14′
2 Orlop	21′-0″	10′x10′
(or 2nd class)		
3 Orlop	58′-0″	12′x12′
Main Dk. Freight	88′-0″	18′x14′
and by Freight doors	9′-2″x7′-10″	

Capacities

Cargo Space

Compartment	Grain	Bale
No. 1 Cargo hold	12,700	11,000
No. 2 Cargo hold	8,050	7,250
No. 1 Orlop deck cargo hold	12,700	11,170
No. 2 Orlop deck cargo hold	6,030	5,370
No. 3 Orlop deck cargo hold	16,190	15,360
Main deck freight ..... space	35,200	29,570
	90,870	79,720

Refrigerated Space

Compartment	Cu. Ft.
In No. 3 Orlop deck cargo hold.	2,650 cu. ft.

Also domestic cold store.

Bunkers

Compartment	Cu. Ft.	*U. S. Gals.	
No. 3, Double Bottom..	1,108	8,334	Port & std.
No. 4, Double Bottom..	1,774	13,344	Port & std.
Side Cross Bkr.....	6,446	48,484	Port & std.
Center Cross Bkr.....	3,360	25,272	Port
Center Cross Bkr.....	3,060	23,017	Std.
Aft. Side Bkr.....	3,492	26,266	Port & std.
Ford. Side Bkr.....	3,532	26,566	Port & std.

*39 cu. ft. per ton; 42 U. S. gals. per bbl.

Tanks

Compartment	Cu. Ft.	Tons F. W.	Tons S. W.
No. 1	1,510		43
No. 2	1,720		49
No. 5	2,810		80
No. 6	1,410	39	
No. 7	920	26	
No. 8	950		27
No. 9	710		20
Fore peak	930		27
Aft peak	2,670		76
Total	13,630	65	322

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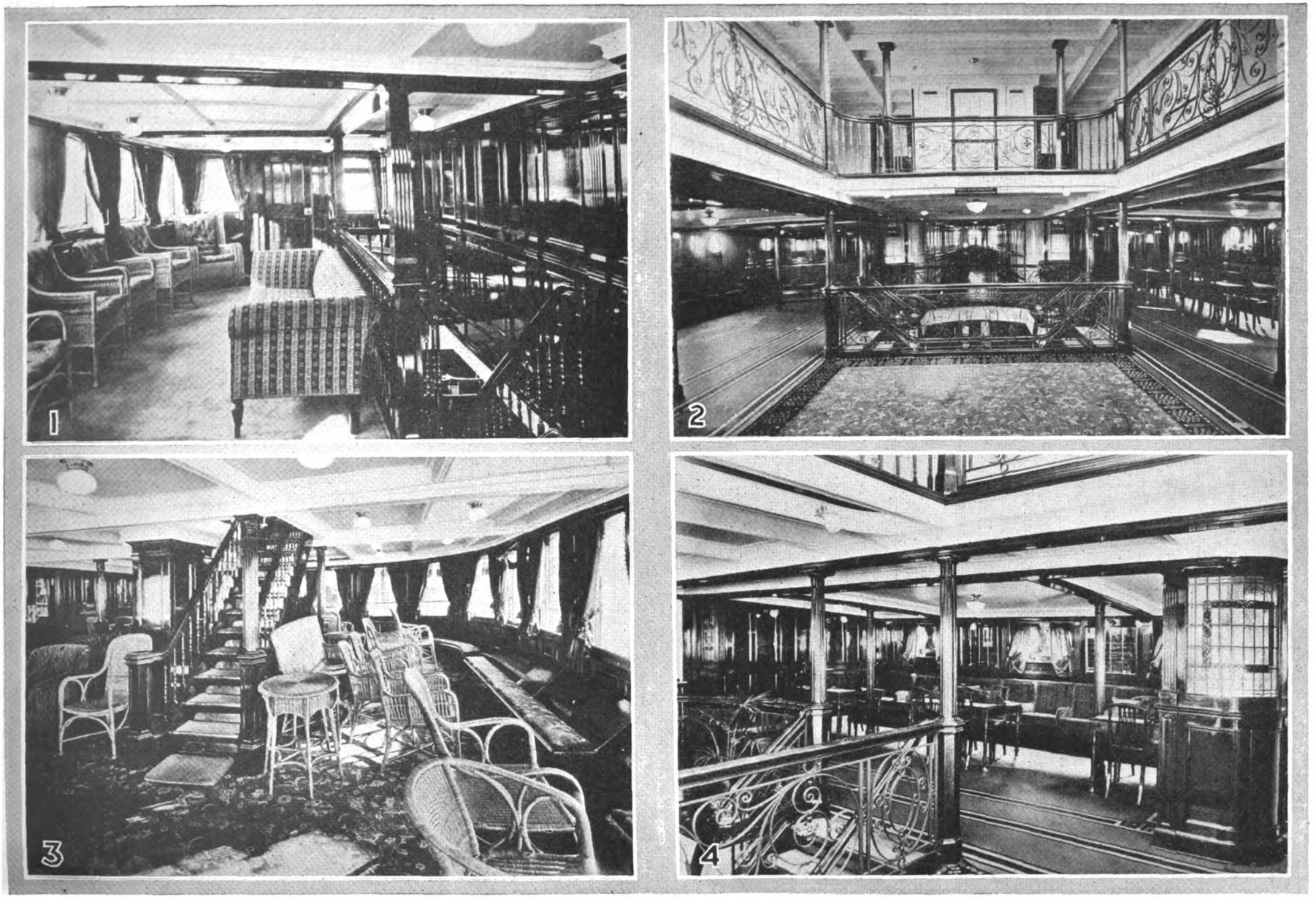

Interior Views S. S. Princess Louise: (1) Library, On Bridge Forward; (2) Social Hall Aft, Looking Aft, Ladies' Sitting Room on Starboard Side and Writing Room on Port Side; (3) Observation Room Forward, Stairs Lead to Library Above; (4) Writing Room and Entrance to Dining Saloon in Social Hall Aft

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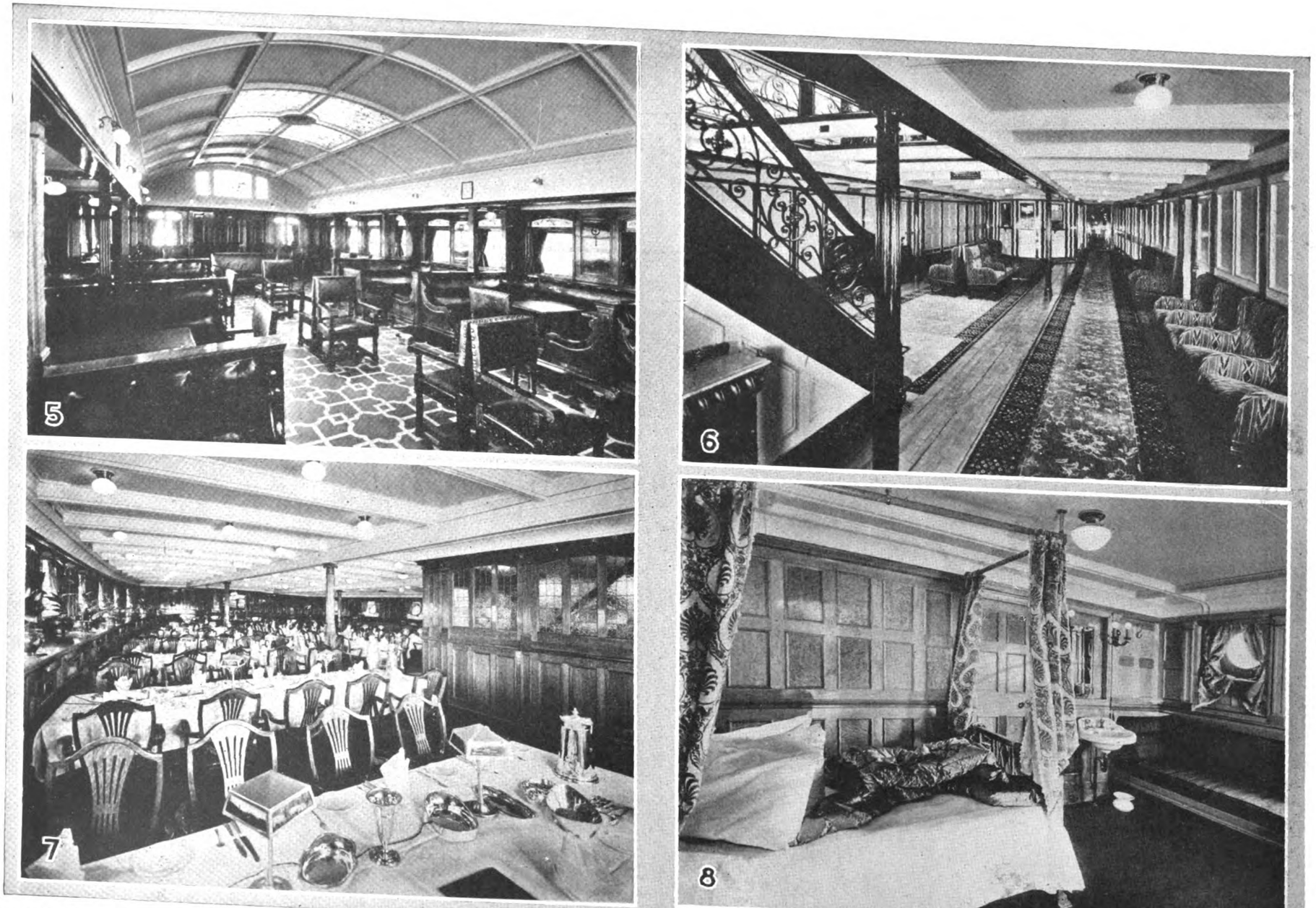
...; (3) Observation Room Forward, Stairs Lead to Library Above; (4) Writing Room and Entrance to Dining Saloon in Social Hall Aft



Interior Views S. S. Princess Louise: (5) Smoking Room, Looking Aft; (6) Social Hall and Purser's Office Forward; (7) Dining Saloon, Looking Aft; (8) Special Stateroom, Finished in Bird's-Eye Maple Panelling

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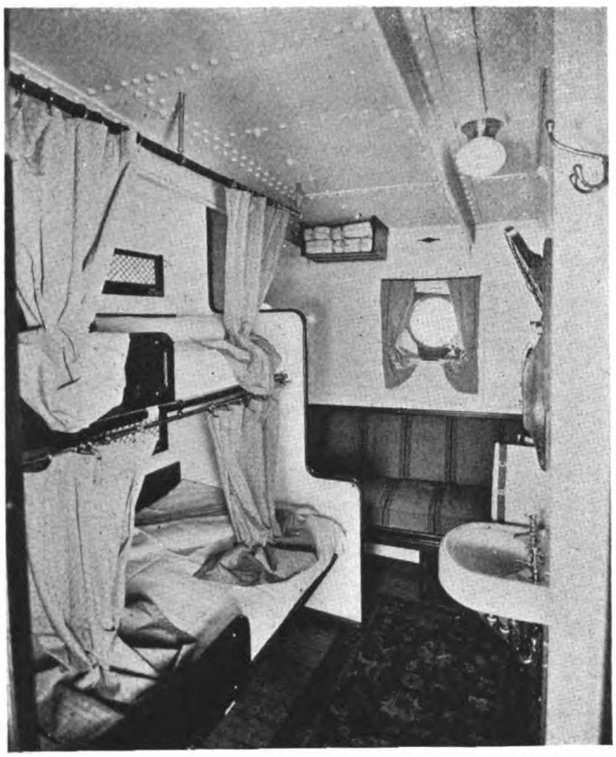
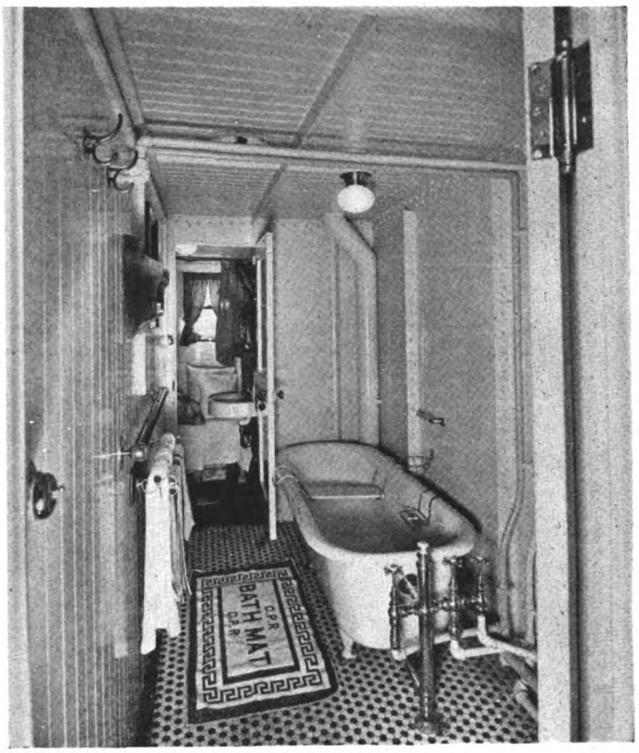


First Class Stateroom

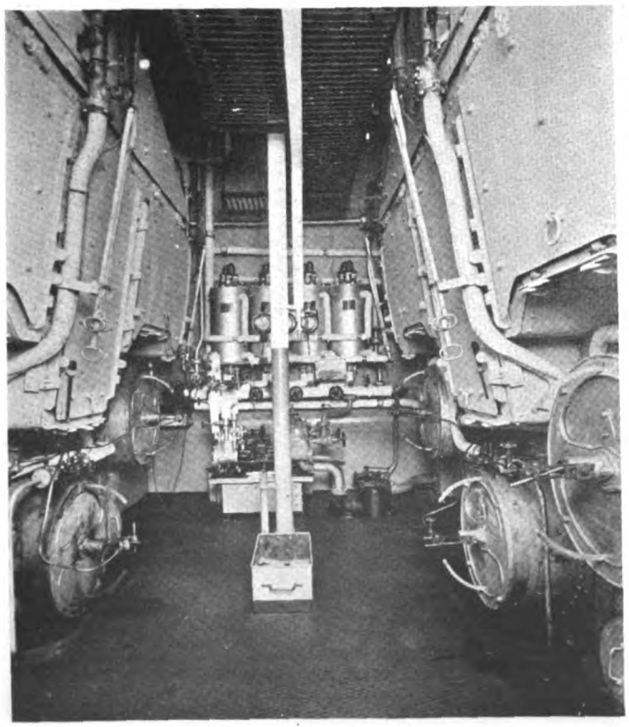


Private Bathroom

been fitted. There are four 5-ton booms, and one capable of handling 15 tons on the forward mast. The forward hatch is trunked between the promenade and awning decks, and has been so arranged that on the triangular or local run it can be used as a baggage room, the floor being arranged to hinge upwards.

The winches are of the vertical oscillating type, two winches being arranged so that they are handled by one man.

The vessel has very complete mooring arrangements consisting of two warping capstans and one windlass and is provided with wireless telegraphy.



Stokehold, Looking to Port, Showing Oil Fuel Arrangements

General Arrangement

As shown by the deck plans, there are three decks for first-class passengers and two combined freight and passenger decks. The boat deck contains twenty-nine two-berth cabins, two suites de luxe with separate toilets and combined bathroom. On this deck are also situated the library, with a staircase to the observation room below, the officers' cabins and wireless house. The captain's cabin is a particularly spacious and well-furnished room with a bay window. The library is very handsomely framed in Honduras mahogany with large plate glass windows commanding views ahead and on either side. It contains two very tastefully designed bookcases, with leaded glass panels, embodying Canadian dogwood as a floral motive. The floor is covered with a beautiful pile carpet and very comfortable cane chairs complete the furnishings of what is sure to become the most popular room on the vessel.

Each deck has been provided with its own public lavatories and bath rooms for men and women.

The promenade deck, with its spacious forward end and wide promenade spaces at the sides, contains forty-two two-berth cabins. On this deck are situated the first class smoking room and observation room. The latter, commanding views ahead and on either bow, is framed in Honduras mahogany. The framing in way of the alcove at the after end is relieved with buttoned mirrors. The pipe trunk in the center of the room also contains a buttoned mirror. The upper portions of the swing doors are of bevelled glass, protected with a brass grill. The floor is carpeted and in front of the cane chairs are upholstered footstools.

The smoking room, at the after end of the vessel, is an exceedingly handsome room, framed in black walnut, with large plate glass windows and a barrel roof overhead with a central light framed in leaded glass, embodying the dog-

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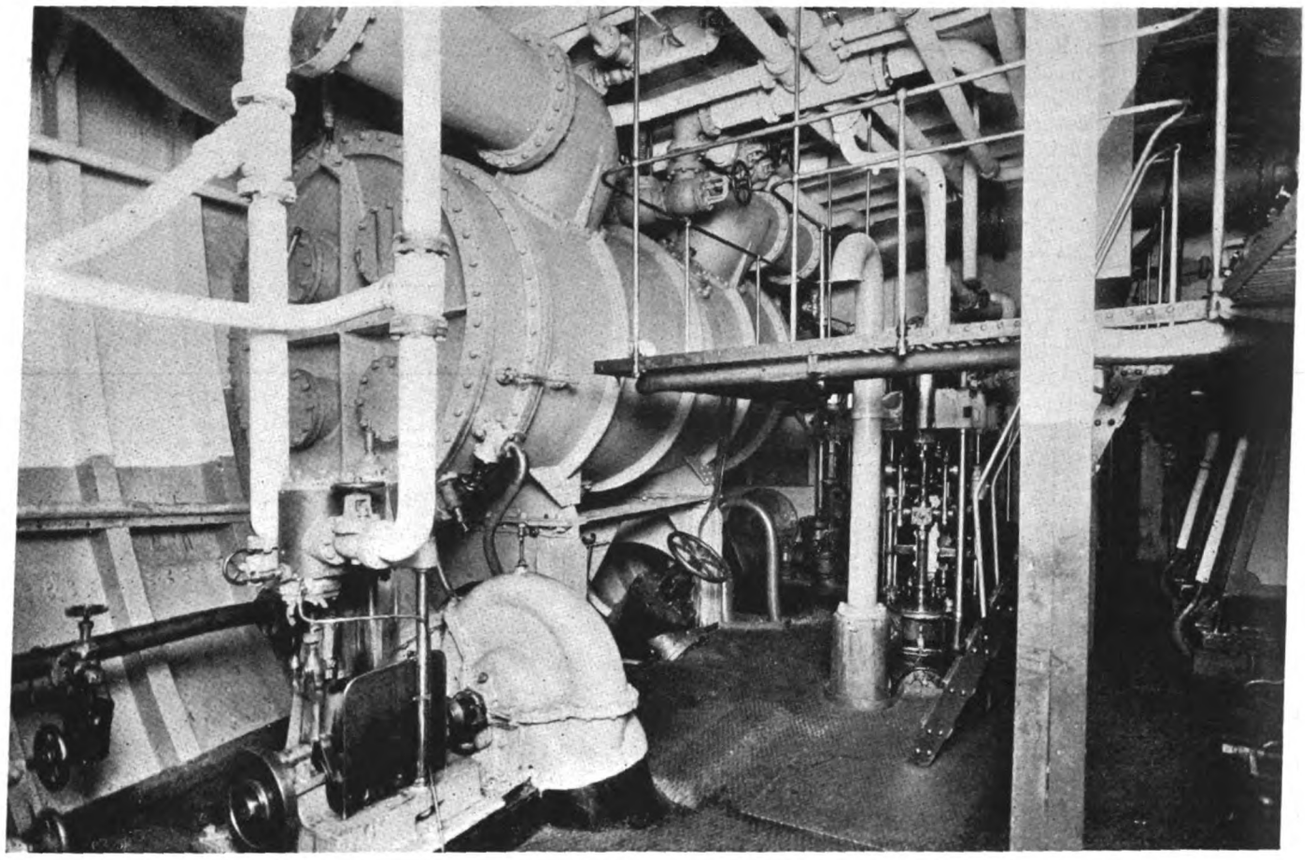
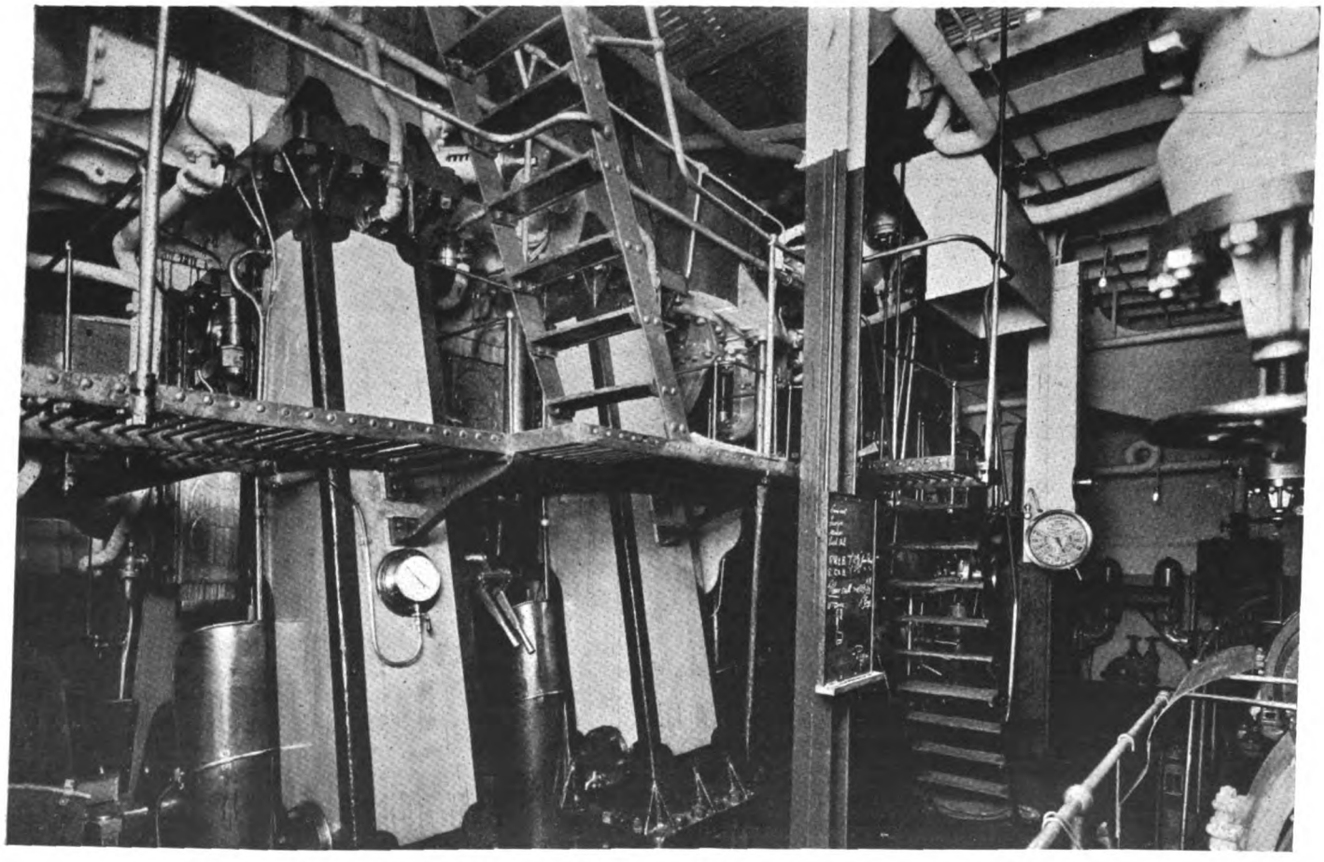


Engine Room, Port Side, Showing Condenser and Auxiliaries



Engine Room of Princess Louise, Starboard Side, Looking Forward

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wood as a floral motive. The after and forward ends of this roof also have leaded lights, having as their decorative scheme a representation of the "Siwash Rock" and the "Lions," two well-known local scenic features. The floor is covered with linotile, as are also all passageways on this deck. The forward well is beautifully framed with a white enamel finish. The skylight above has a representation of the arms of individual Canadian provinces in each of its ten panels. In the after skylight the panels have motives representing British Columbia industries.

All the balustrades are of wrought iron, with small gilded rosettes in the center for decorative effect.

There are two stairways leading to the awning deck, which is the main passenger deck, containing altogether sixty cabins, twenty-two of which have a sofa berth in addition to the two Pullman berths.

On this deck are also four suites de luxe, each with an individual toilet, and a bathroom common to two. Between each suite there is an alcove containing a folding berth with swinging doors, such that the alcove can be made part of the room or a passage between the suites. One suite is framed in bird's-eye maple and its neighbor in satin walnut. On the opposite side of the vessel the two suites are finished in tapestry panels with handsome stucco floral moldings. Each suite has a double brass bedstead, dressing table and wash basin with mirror set in the panelling.

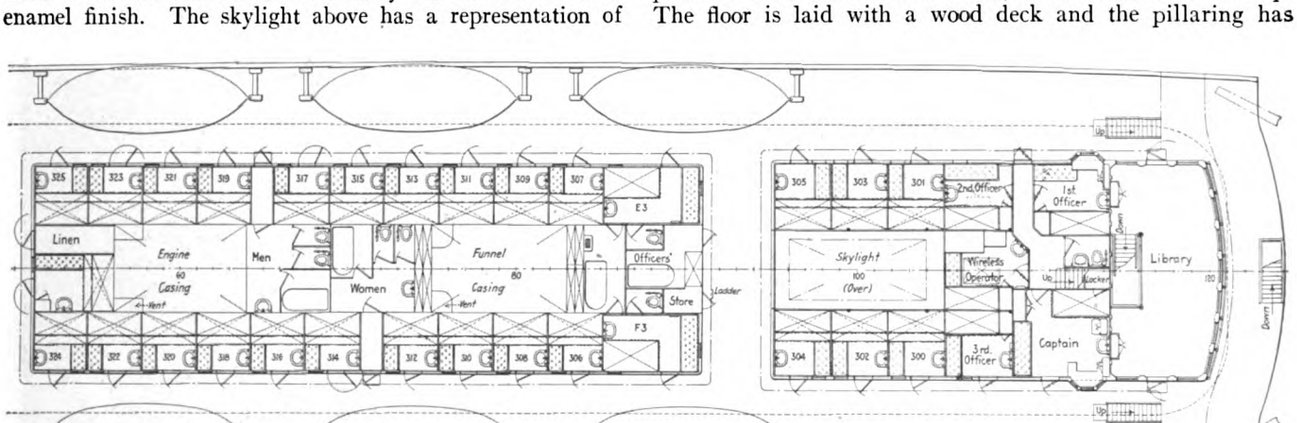
Forward on this deck is the main entrance, beautifully framed in walnut with the floor covered with linotile of tasteful design. The fairweather doors have small glass panels on their upper portions. Leading from the main entrance forward are the barber's shop and baggage room. The waiters and executive officers are berthed forward of the main entrance on this deck.

Aft of the main entrance is the social hall, containing the purser's office and main staircase, with a mirror at the top. The floor is laid with a wood deck and the pillaring has been so arranged as to give space for dancing. All around the sides are upholstered arm seats.

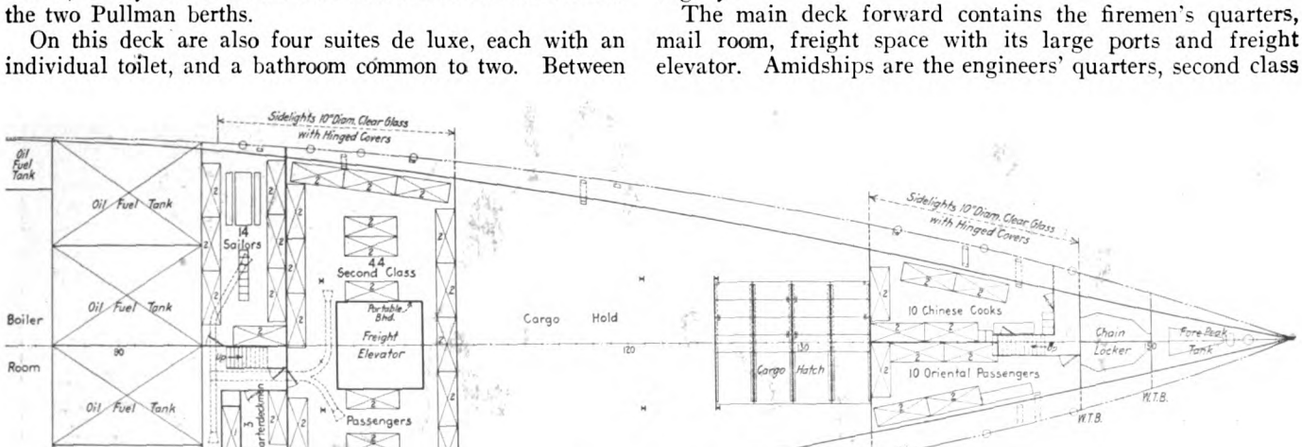
All of this deck, aft of the forward social hall is laid with linotile of varying designs. Aft is the stairway to the dining saloon, located on the main deck below surrounded with wrought iron balustrades while on either side are the writing rooms and sitting rooms, respectively, each framed in mahogany.

The main deck forward contains the firemen's quarters, mail room, freight space with its large ports and freight elevator. Amidships are the engineers' quarters, second class smoking and dining saloon, crew's mess, bakery and butchery and cold storage rooms. Aft are the galley and dining saloon. The galley is very completely equipped and is entered from the dining saloon by two leather covered swing doors.

The dining saloon, with tables to seat one hundred and forty is framed in natural oak, with a shelf at the sides. At the after end is the sideboard with mirror and cabinets, with leaded glass doors. At the forward end is a handsome screen, with its swinging doors shutting off the staircase. The upper half of this screen is framed in leaded glass.



Arrangement of Accommodations on Boat Deck



Forward Orlop Deck Arrangement

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Underneath the staircase is the silver locker with a very complete layout of drawers and shelves. The side ports are 16 inches in diameter and are arranged in couples. The floor is laid with black and white linotile squares.

The orlop deck, in addition to freight spaces, contains the second class accommodations and crew's quarters.

One very noticeable feature in connection with the comfort of the travelling public is the fact that a hot and cold water system has been installed throughout the vessel, each cabin having a basin with a hot and cold supply. The baths have also a cold salt supply.

In connection with safety appliances it may be mentioned that the boats are swung on Steward davits, this being the first Canadian Pacific Railway vessel to be so equipped.

PROPELLING MACHINERY

The propelling machinery consists of one set of four cylinder triple expansion engines, balanced on the Yarrow-Schlick-Tweedy system, designed to develop 4,500 indicated horsepower, at full speed. The cylinders are 28, 43, 50 and 50 inches diameter with a common stroke of 39 inches.

The cylinders are all separate castings and are fitted with liners, the spaces between the liners and the bodies being utilized as steam jackets. The bedplate is cast in two sections and bolted together at about the middle of the engine.

The crank shaft is built up in two sections, one section carrying the forward low pressure and high pressure cranks, and the other the intermediate pressure and after low pressure cranks, the two sections being connected by solid flanged couplings.

The propeller is built up, having manganese bronze blades and a cast steel boss.

Steam is supplied at 180 pounds per square inch by four Scotch marine boilers, each 16 feet in diameter by 12 feet long and having 3,340 square feet of heating surface. The boilers are operated under a closed stokehold system, air being supplied by two engine driven fans.

Oil fuel is used, a pair of horizontal duplex pumps drawing the oil from the bunkers, through suction strainers, and discharging through a battery of heaters and discharge strainers to the furnaces. The furnaces have a ring of fire brick inside the fronts and a hanging arch at the back end. The combustion chambers are also fitted with a checkerwork brick wall.

AUXILIARIES

The condenser has a cylindrical steel shell made of one piece of plate with the end bars welded on and with the longitudinal seam electrically welded. The tubes are of Admiralty mixture and are packed at both ends with corset lacing secured by shoulder ferrules.

Cooling water is circulated through the condenser by an independent centrifugal pump driven by an open engine.

To draw the condensation and air from the condenser a Dual air pump is provided, fitted with a cold water circulating arrangement to reduce the density of the vapor.

A pair of vertical simplex pumps take the feed water and discharge it through the filter and feed water heater to the boilers. The feed water heater is of the surface type and is supplied with exhaust steam at 5 pounds pressure. Each feed pump is large enough to supply the boilers when running at full power.

Other auxiliaries include the general service, ash ejector, ballast and cold and hot fresh water pumps. The latter circulates hot fresh water to all wash basins in the vessel.

The electric generating plant consists of two 63 kilowatt 110 volt dynamos, each driven by an enclosed forced lubrication compound engine.

A small CO_2 refrigerating plant is located in the shaft tunnel.

Steam and exhaust piping in the machinery space is in general of solid drawn copper. The main and auxiliary steam pipes from each boiler are extra strong lap welded steel pipe with the pipe expanded into forged steel flanges. All steam and exhaust piping is covered with efficient insulation. The bilge and ballast piping is cast iron with lead bends, except in the stokehold where the bends are extra strong lap welded steel, the extra strong pipe being provided to compensate for corrosion.

Oil fuel piping is lap welded steel with pressed steel flanges. At all distribution points in the piping manifolds are provided.

The boilers were built by the Vulcan Iron Works, Ltd., of Vancouver, while the main engines and practically everything in the engine room, except the auxiliary machinery, were built in the yard's own shops.

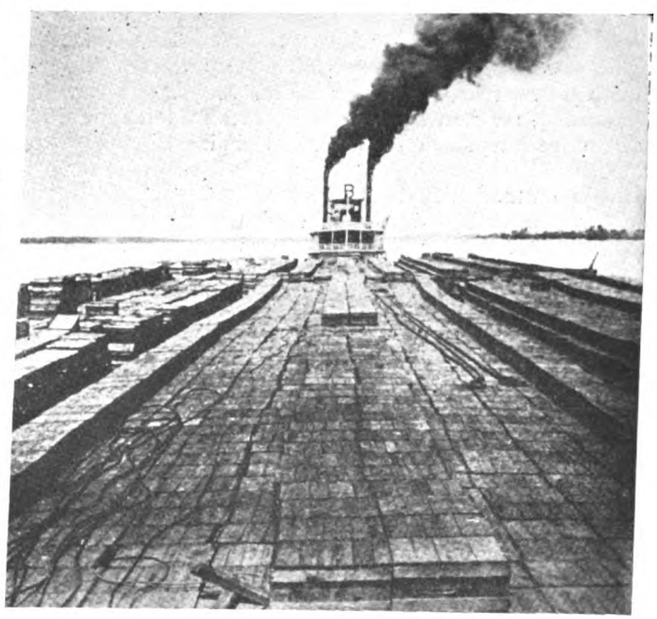
TRIALS

During the trials the machinery ran exceptionally well. Opportunity was taken during the run from Vancouver to Esquimalt Dry Dock to get everything worked in. The care taken during construction was amply repaid on the trials as there was no sign of heating at any of the bearings.

The balance was also all that could be desired as at the highest rates of revolution the slight athwartship rocking, which is characterestic of this type of engine, was not apparent.

The trials consisted of an endurance run of about four hours' duration at the rate of revolution required to give the contract speed of 16 knots. This was carried out without trouble and steam was easily maintained. The progressive trial was a series of runs, in pairs, over the Parry Bay measured mile. Commencing at 12 knots the speed was increased in steps of about 1 knot until a maximum of 17.48 knots was obtained.

So far as the builders are aware the main engines for the *Princess Louise* are the largest marine engines, and also the first balanced, four cylinder triple expansion engines, which have been built in Canada.



Mississippi River Steamer Handling a 5,000-Ton Tow

The illustration shows the Mississippi River steamer *Mamie S. Barrett*, of the Barrett Towboat Company, Cairo, Ill., towing six barges loaded with approximately 5,000 tons of cargo from the head of the Ohio River to New Orleans, La. The *Mamie S. Barrett* is propelled by a pair of compound engines built by the Charles Barnes Company, Cincinnati, O. The diameter of the high pressure cylinders of these engines is only 10 inches and the fuel consumption is approximately 2½ tons of bituminous coal in 24 hours. Considering the power of the vessel and its small consumption of fuel the volume of tonnage handled is remarkable.

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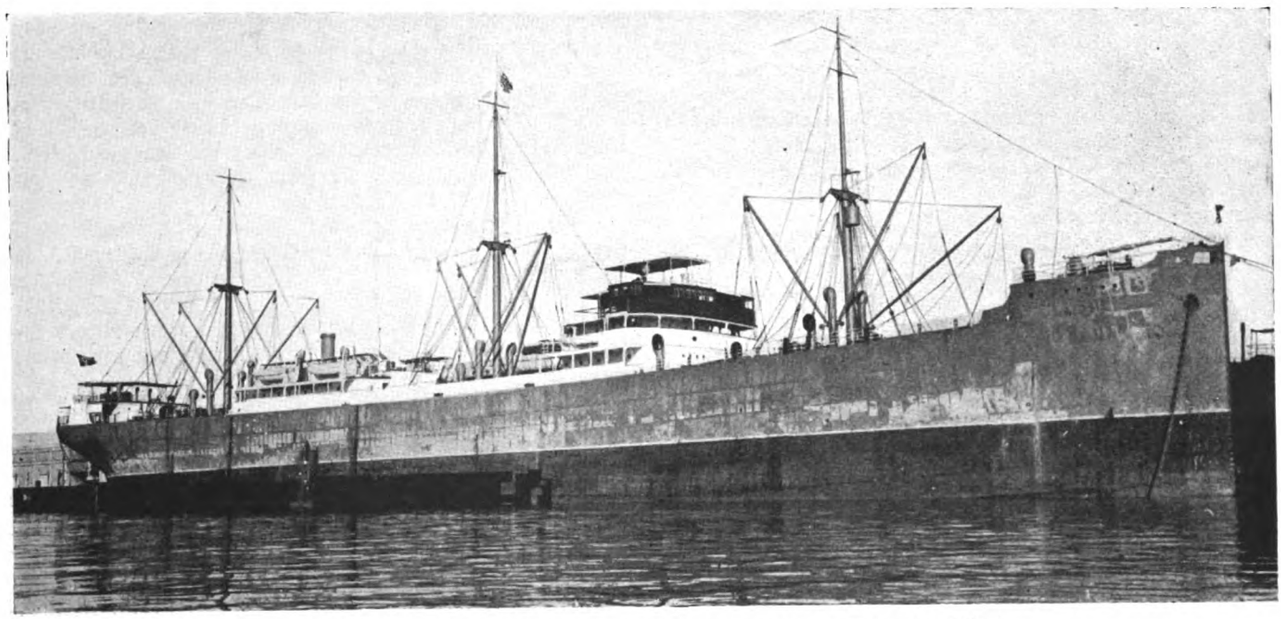

Motorship Handicap Loading Case Oil at Port Arthur, Tex., for China

9,000-Ton Deadweight Norwegian Motorship Handicap

Description of Novel Features and an Analysis Showing the Advantages of the Motorship Over the Steamer

By Edward B. Pollister

ON May 15, 1922, the motorship *Handicap* arrived at Port Arthur, Texas, in ballast from Hamburg, and loaded a full cargo of Texas Company case oil for China. The installation of Sulzer two cycle Diesel marine engines was inspected by several marine engineers and representatives of eastern shipowners and shipbuilders, who were interested in the many novel features presented for the first time in the adaptation of the Diesel engine to cargo ship propulsion.

In the latitude of Port Arthur, Texas, the engine room of the *Handicap* with its highest recorded temperature in the tropics of 108 degrees Fahrenheit, was found to be cooler than on deck.

Captain Gustav Sundaa and Chief Engineer Holms extended every courtesy to the visitors.

The *Handicap*, the largest vessel (steam or motor) ever built in Norway, has fine lines and an attractive appearance. Including bunker fuel, she has a deadweight capacity of 9,000 tons on summer freeboard. The ship was constructed by Rosenberg Mekaniske Verksted, at Stavanger, for Messrs. Bruusgaard Krosterud and Company, of Drammen, to the highest class in Norske Veritas (the Norwegian Register) and according to the rules and regulations of the Norwegian Board of Control.

The *Handicap* completed her trials December 14, 1921, and left Stavanger on December 24, for Newport, there loading 7,760 tons of coal for Bahia Blanca. No trouble was experienced with the propelling machinery and on arrival at Bahia Blanca she maneuvered under her own power and did not require the help of a tug.

Performance on Maiden Voyage

Stavanger to Newport	980 miles
Newport to Bahia Blanca	6,390 miles
Mean speed of ship	10¾ knots
Total daily fuel consumption	9.4 tons
Total daily lubricating oil consumption	24.3 gallons
Return voyage—Bahia Blanca—Hamburg	6,943 miles
Mean speed	10 knots
Total daily fuel consumption	10.2 tons
Total daily lubricating oil consumption	22.2 gallons

The *Handicap* sailed from Bahia Blanca with a full cargo of grain, encountering strong winds and heavy seas throughout the whole voyage to Hamburg. Heavy storms were encountered on April 3 and 4, which reduced the speed of the ship at times to 8¾ knots.

The fuel consumption includes not only the fuel used for the main engines, but also that necessary for the auxiliary engines supplying current to the motors for the turbo blowers for lighting, heating, cooking, steering gear and auxiliary machinery.

Dimensions and General Particulars

Length, between perpendiculars	415 feet
Beam, molded	54 feet 6 inches
Depth, molded to shelter deck	36 feet 11 inches
Deadweight capacity, about	9,000 tons
Gross tonnage, about	5,200 tons
Speed, fully loaded	11 knots
Fuel consumption, per day	9.3 to 9.5 tons
Main engines, twin screw	2,700 shaft horsepower
Type	Sulzer, 2 cycle, controlled port scavenging
Number of cylinders per engine	4
Cylinder bore	600 millimeters (23⅝ inches)
Piston stroke	1,060 millimeters (41¾ inches)
Speed	100 revolutions per minute
Auxiliary engines	two, each of 330 brake horsepower
Type	Sulzer, 2 cycle
Speed	210 revolutions per minute
Total weight of main engines, including thrust bearings, flywheels, turbo-blowers, with motors, exhaust silencers, starting and injection air tanks, about	752,400 pounds

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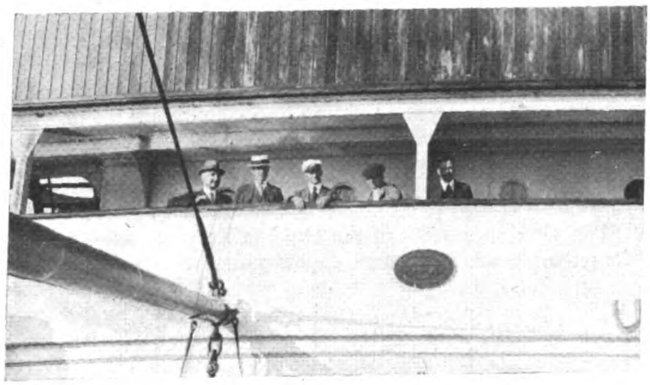
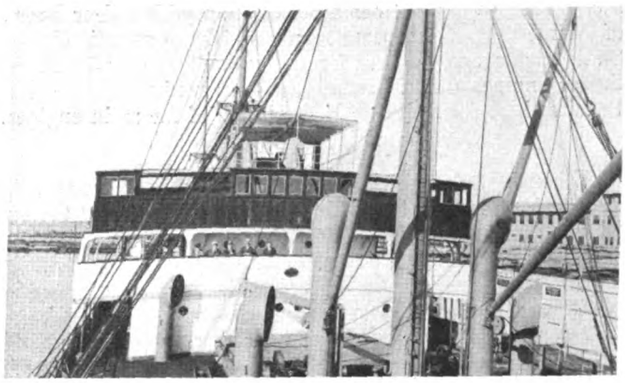


Captain Sundaa (center) on the Bridge of the Handicap



Deck View of Motorship Handicap, Looking Aft

Weight per brake horsepower of main engines.....278 pounds
Total weight of auxiliary engines, without electric generators, but with flywheels, silencers and air tanks .....136,400 pounds
Weight per brake horsepower of main engines.....50.5 pounds
Total weight of main and auxiliary engines, per brake horsepower of main engines.....328.5 pounds

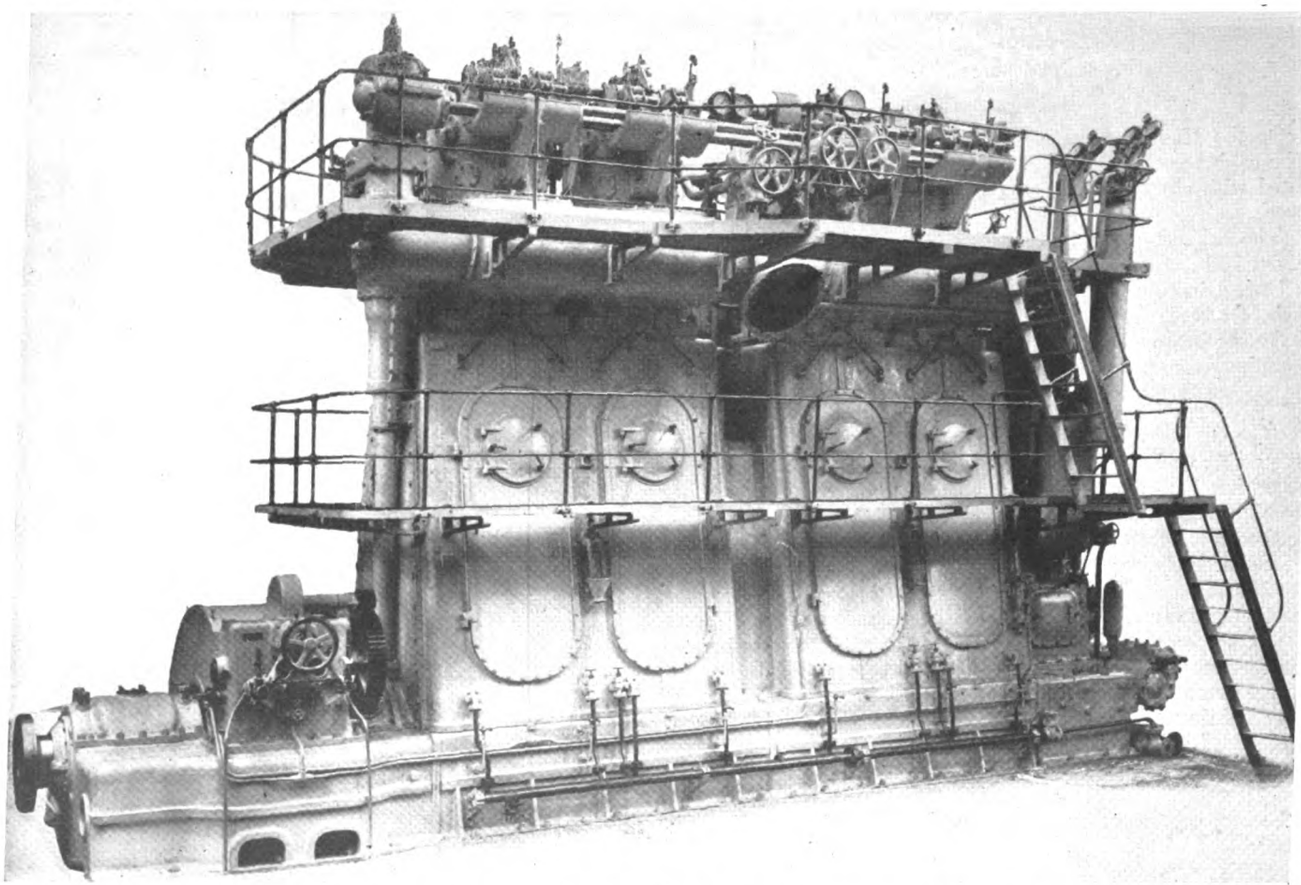
MAIN ENGINES

The main engines have four working cylinders, 23⅝ inches diameter and 41¾ inches stroke, with the injection air compressor built integral with the engine. Air for scavenging is furnished by electrically driven turbo-blowers. The visitor is at once impressed with the short length of the engine room (about 40 feet) which this arrangement makes possible. The maneuvering station is located at the upper engine platform, Chief Engineer Holms being strongly in favor of this arrangement, which gives the operating engineer an unobstructed view, at the cylinder head level, of the entire engine room, including valve gear and switchboard. An assistant on the lower grating handles the auxiliaries.

The engines are capable of being operated continuously at maneuvering speeds as low as 25 revolutions per minute and require a comparatively small quantity of injection air under such conditions due to the Sulzer control of lift and duration of opening of the fuel valves.

The Sulzer thrust block, built as an extension to the main bedplate, is similar in principle to the *Kingsbury* type. It is lubricated from the lubrication system on the main engine and showed practically no wear.

The general design of the engines is similar in all important features to the Busch-Sulzer marine Diesel, built by Busch-Sulzer Bros.-Diesel Engine Company, St. Louis,



Sulzer, Two-Cycle, Marine Diesel Engine Designed to Develop 1,350 Brake Horsepower at 100 Revolutions per Minute With Independently Driven Scavenging Pump

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Mo., which enjoys partnership affiliation with Sulzer Bros., of Winterthur, Switzerland, and which owns all United States rights and patents for the manufacture and sale of Sulzer engines in this country. Space will, therefore, not be taken here for a technical description of the main engines.

TURBO-SCAVENGING

Although Sulzers have furnished numerous large submarine installations in which the scavenging air for the engines is supplied by electrically driven turbo-blowers, instead of by scavenging pumps built integral with and driven by the main engines, the *Handicap* is the first commercial vessel so equipped. There are two blower sets, each of capacity for both main engines, one acting as spare. The two sets are located on the level of the control station at the forward engine room bulkhead, one on the starboard and one on the port side, in compartments closed off from the main engine room by doors, the motor blower set requiring about 7 feet by 8 feet floor space. They occupy no part of the engine room which would be otherwise utilized, and the air piping is carried beneath the gratings to the engines in such a manner as to avoid obstructing any passages and yet to be readily accessible from below. The air may be taken from the deck above, or from the engine room floor level to assist ventilation in hot climates. This results in a remarkably cool engine room, the main floor level not exceeding 86 degrees Fahrenheit when passing the equator, although the temperature at the control station was about 108 degrees Fahrenheit.

The blowers are operated at 2,800 to 3,400 revolutions per minute, by 220 volt, direct current motors, without vibration or excessive noise. It has never been necessary to shut down a blower due to faulty operation, and absolutely no trouble has been experienced with these sets. The commutators on the motors were smooth, and an entire absence of sparking at the brushes was noticeable. The power required for the blowers is about 4 percent of the power of the main engines during normal operation.

NO STEAM USED

On the *Handicap* the use of steam is entirely eliminated. The cabins are heated by electric radiators and the galley is fitted with electric range, electric boilers and an exhaust-gas oven.

The exhaust gases from the engines, at a temperature of about 700 degrees Fahrenheit, are led around an oven which affords a baking heat of 300 degrees to 500 degrees Fahrenheit, attained without additional fuel cost and sufficient to bake the bread for a crew of 35, when the main engines are running. In port, the oven of the electric range is used.

AUXILIARY DIESELS

The auxiliary Diesels are larger than are usually found on motorships of this size, but are more efficiently employed. The number of auxiliary units has been reduced to the minimum of two—each capable of handling maximum requirements, and consisting of a four cylinder, 330 brake horsepower Sulzer two-cycle crosshead type Diesel, coupled to 200 kilowatt, 220-volt generators, operating at 210 revolutions per minute. The length of the engine is about 13 feet.

At sea, one of these units supplies electric power for the turbo-blower set (about 110 brake horsepower), the engine room pumps, auxiliaries, and steering engine, and current for lighting and heating the cabins and for cooking. The total load at sea averages about 200 brake horsepower.

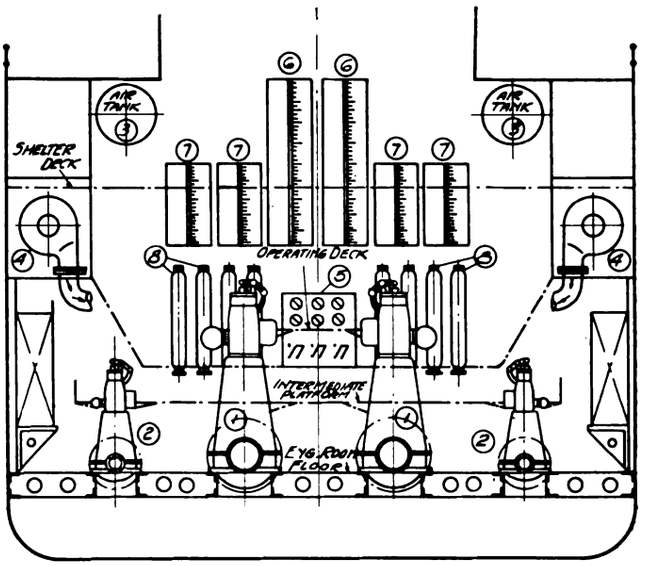
In port, one unit takes care of the maximum requirements of 10 electric winches of the Asea type, built in Sweden, and the lighting, heating, cooking and small engine room auxiliaries.

This arrangement accordingly results in the auxiliary Diesel capacity, required for winches in port, being largely employed at sea in driving the turbo-blower supplying scavenging air to the main engines, which may therefore be built smaller and shorter. The total weight of the equipment is reduced and the load factor on the total brake horsepower of main and auxiliary engines is increased.

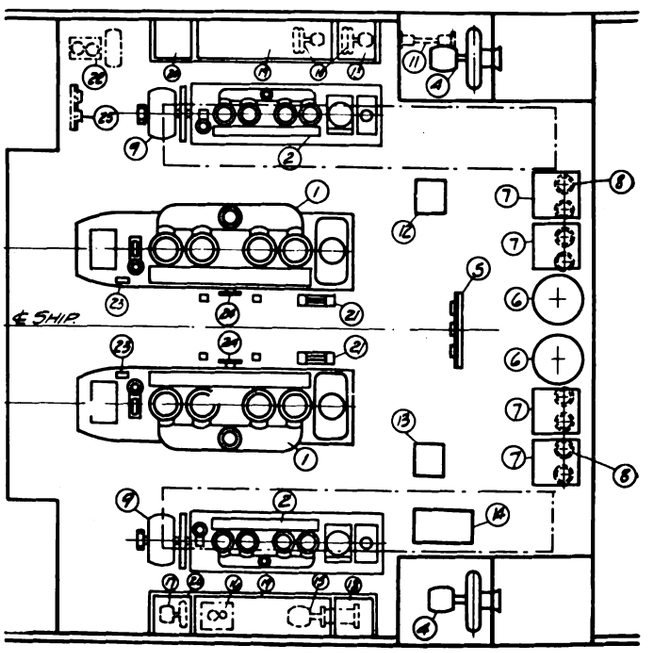
A hot bulb emergency lighting and compressor set provides 15 kilowatts capacity for port lighting, when the winches are not in use.

ELIMINATION OF AUXILIARY AIR COMPRESSORS

The air compressors of the two auxiliary Diesels are oversize; their combined excess capacity is sufficient for driving



Section Through Engine Room, Looking Forward



Plan of Engine Room

1—Main engines
2—Auxiliary engines
3—Low pressure air tanks
4—Turbo blowers, motor driven
4A—Suction chamber to turbo blower
5—Switchboard
6—Fuel service tank
7—Lubricating oil tanks
8—Starting air tanks
9—Auxiliary engine generator
10—Cooling pumps
11—Fuel service pump
12—Fuel transfer pump
13—Bilge pump
14—Ballast pump
15—Fire pump
16—Ice machine
17—Fresh water pump
18—Fuel service tanks for auxiliary engines
19—Reserve lubricating oil tanks
20—Reserve lubricating oil tanks
21—Lubricating oil pump
22—Emergency lighting set (8-kilowatt)
23—Barring engine
24—Reversing engine
25—Switchboard for emergency set

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one main engine, which provides the required reserve compressor capacity for emergencies. This saves the installation of the usual motor driven auxiliary compressor of about 150 brake horsepower for this size of vessel.

The surplus air is used for charging the starting and maneuvering air tanks of which there are eight, each having a capacity of 28 cubic feet at 60 atmospheres.

Air at any pressure from 60 to 20 atmospheres (850 to 285 pounds per square inch) is utilized for starting and maneuvering, the high pressure storage providing ample reserve capacity for extensive maneuvering on entering port.

A large supply of low pressure air, 200 pounds per square inch, is carried in separate tanks for the operation of the maneuvering motors on the main engines, the turning engines, the siren and for minor purposes, including small auxiliary lubricating pumps used before starting up.

Captain Sundaa, who "went down to the sea" as a cabin boy on a windjammer at the age of fourteen, accepts the motorship in the same spirit that he was forced to accept the steamer, years ago—one of reluctance, tempered with a desire to be first with a new type of vessel which was bound, in his opinion, to replace the old.

Telling the story as nearly as possible in the captain's words: "The engines run quietly, without sufficient vibration to tell, from his cabin, whether they were running or shut down. Cylinder heads were being removed for the first time in five months, to meet provisions of semi-annual inspection required by the Norwegian Board of Control. Aside from minor grinding of valves and adjustments, no repairs had been necessary, the cylinders and combustion chamber parts were clean and the wear of rubbing surfaces extremely small."

So far the ship had given a good account of herself, the only stoppage at sea having been due to air pockets in the fuel line, on a voyage to South America, and a safety gasket blowing out on the trip from Hamburg to Port Arthur.

IMPORTANT ADVANTAGES OF THE MOTORSHIP OVER STEAM IN ADDITION TO THE FUEL SAVING

The fuel consumption of the *Handicap* is only 9.3 to 9.5 tons a day, for 11 knots, as against 30 tons for a steamer. Only 3 men, namely a motorman, a junior motorman and an oiler, are required on a watch in the engine room, two electricians, two wiper boys and a mechanic bringing the engine room crew up to 14.

But other advantages of the motorship over the steamer are of far-reaching importance and not always given due consideration.

The investment in a ship over a twenty-year period is safeguarded more securely by low cost of operation which prevents losses in bad times, than by expectation of big profits in good times.

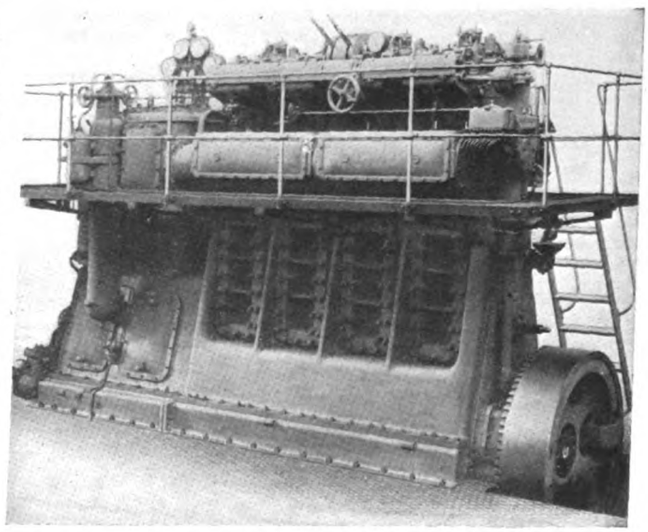
The motorship will average more days at sea, which is the only time a vessel earns money. With approximately ⅓ of the fuel consumption of a steamer, less time is lost in fueling enroute, or in deviating for fuel with additional cost of port charges. More freight can be carried, at rates below the cost of operating a steamer, if necessary for quick return freight. Long voyages can be undertaken to ports where fuel is scarce or high, bunkered with fuel sufficient for the complete turn-about and bought where it is cheapest. The motorship also can, with profit, collect small scattered freight which would be unprofitable for a steamer. The steamship must also secure more freight to pay the higher operating expenses of a return voyage, and this waiting in port cuts down the number of days per annum she will be at sea with profitable freights. While in port, the standby losses of the steamer are, comparatively, very high and, where lack of up-to-date dock freight handling apparatus causes delays of several days, the cost of handling cargo at 6 tons of fuel per day for the steamer as against 0.6 ton for the motorship becomes an important item.

These advantages are illustrated by the present voyage of the *Handicap*.

A full cargo of case oil was offered for China, from Port Arthur, Texas, each case stowing 2.2 cubic feet, weighing 84 pounds, 26.7 cases to the ton, freight rate about $9.00 per ton.

For the outward voyage (about 10,000 miles)—39 days at sea, 11 knots, 9.5 tons per day—370 tons of fuel will be burned, and, with 25 percent reserve, 465 tons carried—without refueling enroute.

With a deadweight capacity of 9,000 tons, including fuel, the maximum cargo which could be loaded at Port Arthur was 8,535 tons, or 228,000 cases. A corresponding steamer must allow bunker capacity for the longest leg—Honolulu to Hongkong, 4,900 miles—19 days at 11 knots, 30 tons of fuel per day, 570 tons burned; plus reserve of 25 percent requires a minimum bunker capacity of 715 tons; thus the maximum cargo which could be loaded at Port Arthur would be 8,285 tons, or 221,000 cases.



Sulzer Two Cycle Auxiliary Diesel Engine. Develops 330 Brake Horsepower at 210 Revolutions per Minute

DIFFERENCE IN FAVOR OF MOTORSHIP

1—Additional freight, 250 tons @ $9.00.....			$2,250.00
2—Steamer must deviate from Canal to Honolulu additional mileage—1 day's run—fuel @ 30 tons per day @ $7.80.....			234.00
3—Port charges—Honolulu, including towing and pilotage			250.00
4—One day additional operation of ship, exclusive of fuel.....			150.00
5—Outward voyage:			
Fuel burned by motorship, Port Arthur fuel, 370 tons @ $9.80.....	$3,615.00		
Fuel burned by steamer:			
Port Arthur fuel 600 tons @ $7.80	$4,680.00		
Honolulu, fuel 570 tons @ $9.25	5,275.00	9,955.00	6,340.00
6—Return voyage:			
Fuel burned by motorship, Hongkong fuel, 370 tons @ $17.60.....	$6,500.00		
Fuel burned by steamer:			
Hongkong fuel, 570 tons @ $15.60	$8,850.00		
Honolulu fuel, 600 tons @ $9.25	5,550.00	14.400.00	7,900.00
Port charges—fueling at Honolulu....			250.00
1 day additional sailing—30 tons fuel @ $9.25.....			275.00
1 day additional operating expenses exclusive of fuel.....			150.00

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7—Loading and discharging cargo—20 days fuel:		
Motorship—Port Arthur 10 days @ 0.6 ton @ $9.80	$59.00	
Hongkong 10 days @ 0.6 ton @ $17.60	105.00	
	$164.00	
Steamer—Port Arthur 10 days @ 6 tons @ $7.80	$468.00	
Hongkong 10 days @ 6 tons @ $15.60	936.00	
	$1,404.00	1,240.00
Total excess cost of operation of steamer		$19,039.00

EARNINGS OF THE STEAMER

Earnings of the steamer—8,285 tons @ $9.00		$74,565
Round trip, returning in ballast 100 days		
Estimate:		
Operating expense, except fuel @ say $150.00 day	$15,000	
Panama tolls @ 2 x $6,000	12,000	
Fuel	26,268	
2 calls Honolulu, port charges	500	53,768
100 days steamer's gross earnings		$20,797

EARNINGS OF THE MOTORSHIP

Earnings of the motorship—8,535 tons @ $9.00		$76,815
Round trip, returning in ballast 98 days		
Estimate:		
Operating expense, except fuel at $150.00 day	$14,700	
Panama Canal tolls @ 2 x $6,000	12,000	
Fuel	10,272	36,972
98 days motorship gross earnings		$39,843
365 days motorship		$147,000
365 days steamer		76,000
Additional gross earnings of the motorship		$71,000

RATIO OF EARNING CAPACITY—MOTORSHIP TO STEAMER—IS 1.93 TO 1

In the above figures a differential of $2.00 per ton has been assumed for Diesel fuel above the price of boiler fuel—which is applicable to all motorships and fair to the 2-cycle, until the claims of the 2-cycle marine Diesel builders, that operation of their engines on boiler fuel is entirely satisfactory have been more definitely established.

Advantages of the greater sailing radius of the motorship and increased earnings due to purchase of fuel in that port where it is cheapest have not been taken into consideration.

It is reasonable to assume that the reduction in the payroll of the engine room crew will more than offset the increased cost of lubrication for the Diesel.

That the rate of depreciation of the steamer is greater than the motorship is shown by the present market price of going steamers, which is less than one half their book value; while practically no going motorships are offered.

The above figures assume steady trade and no idle time, which, of course, would not be the case. If it were, the motorship could cut freight rates sufficiently to wipe out the profits of the steamer and still show gross earnings of $71,000.00 per annum.

As a matter of fact, the $76,815.00 freight money earned by the *Handicap* on her China voyage must pay her expenses from Hamburg in ballast to Port Arthur—Port Arthur to China, and from time of discharge of cargo at Hongkong until she secures another cargo. So that the actual earnings for the year will not be as shown.

That the actual saving is greater than that usually estimated is shown by the growth of motorship fleets—the aggregate of all of the economies and advantages of motorships being best known by their owners.

While a tramp run to the Orient is especially favorable to the motorship, other runs such as Pacific Coast to United Kingdom ports—a turnaround of 25,000 miles, offer almost equally favorable conditions for freight liners.

A steamer, loading deadweight cargo on the Pacific Coast, must hold in reserve sufficient bunker capacity for fuel from the Canal to the United Kingdom, a run of about twenty days. With the differential of 20 tons per day for the above ships, plus 25 percent reserve, 500 tons more cargo could be carried by the motorship at say $12.00 per ton or $6,000.00. On arrival in England, fuel must be purchased at say 60 shillings ($13.50) per ton for port use, and the return voyage to New York—approximately three times as much fuel must be purchased at this comparatively high price, for the steamer as for the motorship.

Considering the progress the motorship is making in the world's merchant marine, the probable obsolescent decline during the next few years in the value of a steamer reduces the comparative fixed charges on the motorship by between 5 and 10 percent and offsets to a degree the added cost of converting existing steam tonnage.

This would be shown by the above figures on earnings, somewhat as follows:

	Motorship	Steamer
Tonnage, deadweight	9,000	9,000
Gross earnings	$147,000.00	$76,000.00
Fixed charges	15 percent	20 percent
(Allowing 5 percent greater depreciation in value of steamer)		
Investment basis, total	$980,000.00	$380,000.00
Investment basis, per ton	$108.80	$42.20
Present sales value going steamer per deadweight ton world's market		$35.00
Corresponding value of motorship on above investment basis	$90.00	

The United States Shipping Board is offering steamships for conversion to Diesel propulsion at prices which will bring the cost of the motorship to about $75.00 per deadweight ton, a price which shipowners would be fully justified in paying, considering the above comparative earnings.

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Argentine Naval Training Ship Presidente Samiento Anchored in North River, New York

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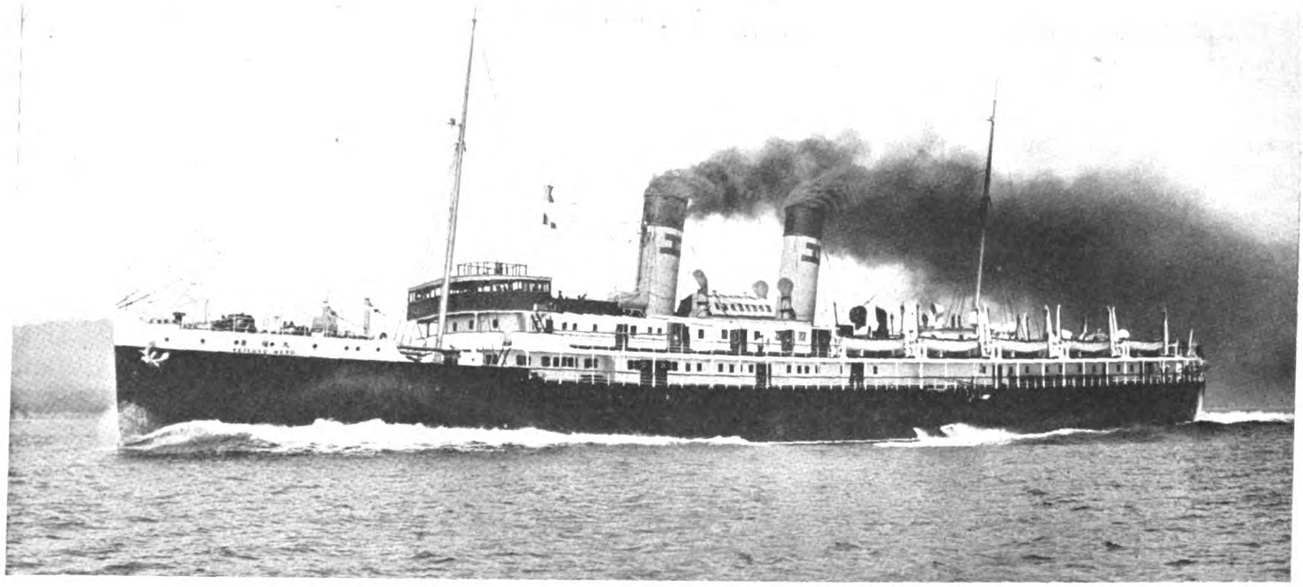

Japanese Channel Steamer Keifuku-Maru on Trial

Twin-Screw Turbine Channel Steamer Keifuku-Maru

First of Three 17¼-Knot Passenger Vessels for Shimonoseki-Fusan Service of Japanese Government Railway Completed at Kobe

THE cross-channel service between Shimonoseki and Fusan in Japan is at present run by the Japanese Government Railway with a fleet of four steamers, the *Koma-Maru, Shiragi-Maru, Iki-Maru* and *Tsushima-Maru,* performing the journey in more than eleven hours. Owing to the recent increase of traffic on this route, it was decided in 1920 by the Railway Department to reinforce the existing fleet with three larger and faster steamers of the latest improved type.

The order for these new ships was placed with the Kobe Works, Mitsubishi Zosen Kaisha, Ltd., Kobe, Japan. The first of the three steamers has recently been completed and delivered to the owners. In their arrangement and equipment, every attention has been paid to the special requirements of this service, and in this respect mention must be made of the work of Mr. T. Morisawa, the marine superintendent to the Government Railway, and his staff, under whose supervision on behalf of the Railway Department the vessel has been completed, while the design of both hull and machinery was entirely entrusted to the builders to fulfill the requirements of the owners.

The leading particulars of the *Keifuku-Maru* follow:

Length overall	375 feet 0 inches
Breadth, molded	46 feet 0 inches
Depth, molded to awning deck	28 feet 0 inches
Gross tonnage	3,620
Draft loaded	15 feet 0 inches
Deadweight capacity, in tons	600
Number of passengers:	
First class	45
Second class	214
Third class	690
Total number of passengers	949

Palm Room Cafe

Smoking Room

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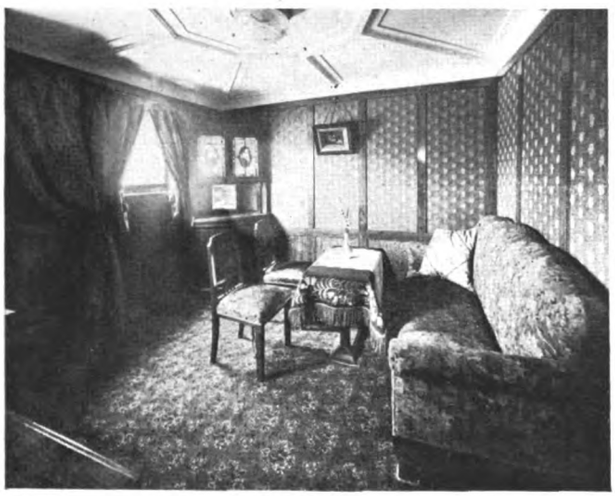
Number of officers and crew	159
Total number of passengers and crew	1,108
Highest speed on trial	20¼ knots
Speed on service	17¼ knots

The *Keifuku-Maru* has been built, engined and equipped in accordance with the Japanese Government Shipbuilding and Inspection Rules under their special inspection as an awning deck vessel of coasting service.

General Arrangement

As shown by the illustrations, the vessel has a short forecastle with a raked stem, cruiser stern, two masts and two funnels.

The double bottom, built on the cellular principle, extends between the peak bulkheads, except under the boiler space. The vessel is subdivided by six transverse watertight bulkheads, all extending to the main deck except the collision bulkhead which is carried up to the awning deck.



Special Sitting Room

There are two complete tiers of decks, viz., the awning and the main, and a promenade deck over the long deck house amidships, a lower deck and a flying bridge deck.

The promenade deck is mainly allotted for the promenade of the first and second class passengers. On this deck forward are the captain's and the officers' cabins and toilets and the special suite of rooms, consisting of a sitting room, bedroom and private bathroom, and a first class stateroom.

The smoking room and palm café are also situated on this deck between two funnels.

Ten lifeboats and one sampan are carried on this deck aft.

The awning deck is almost entirely occupied by the passenger accommodations, the first class staterooms being amidships, the second class sleeping rooms and open space aft. The restaurant and the reception and writing rooms are also on this deck forward of the first class accommodations, and the sailors' quarters are under the forecastle.

On the main deck are part of the third class passenger accommodations and accommodations for the engineers, clerks, doctors, custom officers, etc., the officers' and engineers' messrooms, galleys, sculleries, pantry and stores. There is also a large mail room on this deck forward.

The lower deck abaft the engine space is arranged for the remaining third class passenger accommodations and the baggage room, steering engine space and carpenter's store.

The firemen's and the boys' quarters are located on the lower deck forward of the boiler space, the space below being devoted to a cargo hold. In the forehold are a fish hold, provision stores and the chain lockers.

Passenger Accommodations

Excellent results have been achieved in fitting out the passenger accommodations on the *Keifuku-Maru,* and particular attention has been paid to ensure the comfort and pleasure of passengers consistent with the requirements of a short passage.

The public rooms include a smoking room, palm café, restaurant, and reception and writing room, all of which are tastefully decorated and furnished.

The smoking room is finished in stained oak in the Elizabethan style. A large wagon top skylight with attractively designed stained glass and large square windows admits air and light. A bar with counter is provided at the forward end of the room. The floor is laid with rubber tiling of special design well matched to the room.

A special feature of the palm café, adjacent to the after end of the smoking room, is the striking originality of its design, giving passengers the impression of sitting in a greenhouse on shore. The specially designed windows of exceptional size and a large stained glass skylight aid materially in lighting and ventilating the room. The walls are finished in green trellis work on braided rattan ground over marble skirting, and four artistic oval cloisonné plaques and a large oval mirror are attractively arranged. The floor is covered with rubber tiling of chess-board pattern in dark green and white.

At the after end of the palm café, there is a grand stairway leading to the main entrance on the deck below, which is finished with handsome balusters and hard wood rails. At the head of this stairway is mounted a large oil painting depicting "A country scene of Chosen (Korea)" by Mr. H. Kanayama.

A spacious and airy restaurant, situated at the forward end of the awning deck house, is framed in Nara (a kind of oak) with silk panels over dado of polished Nara. The ceiling is panelled and painted in dull white. A stained glass skylight and glass mosaic plaques are fitted overhead.

A number of small tables accommodating parties of four and one larger table for six in front of the bay-windows on each side are arranged. An imitation fireplace at the forward end adds a homelike touch to the appearance of the room. Surmounting the fireplace is an artistic picture of cut-velvet representing the garden scene of the Keifuku palace. The floor is of neatly designed rubber tiling.

The reception and writing room adjacent to the after end of the restaurant is reached through stained glass swinging doors on each side. The room is tastefully finished with extra large panelling painted in light shade in stained oak framing, decorated with a number of carved relieves. The writing tables, seats, tea tables and chairs, all well harmonized to the room, are comfortably arranged. The floor is covered with rubber tiling.

The special suite of rooms previously mentioned is arranged entirely separate from the ordinary first class accommodations. The sitting room is finished in fumed oak with panels of silk damask. The ceiling is plain but tastefully treated, having ornamental fixtures. A picture of silk embroidery representing resting lions is hung on the wall. The special bedroom is furnished with a large bedstead, dressing table, wardrobe and chair, all of which harmonize with the joiner work of the room. The floors of these rooms are covered with thick carpets.

Effective ventilation for the third class accommodations is provided by means of motor fans.

The electric lighting throughout is on an extensive scale, all fixtures fitted in the public rooms having been designed to harmonize with the general scheme of decoration and architecture.

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PROPELLING MACHINERY

The propelling machinery consists of two sets of Parsons combined impulse and reaction, geared turbines of the modern high speed type. Each set drives one of the twin propellers through a single reduction gearing.

The machinery is designed to develop 8,000 shaft horsepower. Each set consists of two turbines arranged in series, with one high pressure turbine inboard, and one low pressure turbine outboard. The high pressure turbine has one impulse stage and 5 reaction stages of 7 rows each. The low pressure turbine has 11 stages with 22 rows in all. Astern turbines are incorporated in the forward end of the low pressure turbine casings, capable of developing about 60 percent of ahead full power.

A forced lubrication system is provided for all bearings, gearings and shaftings. The main thrust bearings are of the single collar pivoted type.

BOILERS

Steam is supplied by 8 cylindrical marine boilers, designed for a working pressure of 200 pounds per square inch and superheat up to 120 degrees F. The boilers are arranged in two groups of four each with two stokeholds. Forced draft is provided by a closed ash-pit system.

The results of the official trial trip were highly satisfactory, extracts of which are shown tabulated as follows:

RESULT OF OFFICIAL TRIAL TRIP

Date of trial	April 1, 1922
Weather and sea	Fine, calm
Draft, forward	15 feet 2 inches
Draft, aft	15 feet 1¼ inches
Draft, mean	15 feet 1⅝ inches
Corresponding displacement	3,940 tons
Speed (mean of 3 double runs on 3-mile measured course)	19.776 knots
Coal consumption per shaft horsepower per hour	1.3 pounds
Boiler pressure, pounds per square inch	200
Steam pressure:	
High pressure turbine, pounds per square inch	167
Low pressure turbine, pounds per square inch	8
Vacuum, inches	28.5
Revolutions per minute of propellers:	
Port	216.83
Starboard	215.66
Mean	216.25

The electrical equipment of this vessel consists of two 2½ kilowatt Winton generating sets, with large type Edison storage batteries. This equipment will be sufficient to take care of all electrically operated, automatic and auxiliary machinery installed in the boat.

The storage space for supplies will be sufficient to enable the vessel to cruise at great distances from her base of supplies. The cold storage plant consists of an ethyl chloride machine of the Clothel manufacture and several boxes, some in the deck house for daily supplies with others below for cold storage.

John Ringling's Houseboat Zalophus, Just After She Was Launched at the Yards of the Builders

The small boat equipment of the *Zalophus* consists of several fast launches swung on the boat deck to be used by the owner and his party to make trips up small rivers not navigable by the larger boat.

Motor Houseboat Zalophus Launched

JOHN RINGLING'S new steel motor houseboat *Zalophus* was recently launched at the yards of the Consolidated Shipbuilding Corporation, Morris Heights, New York City. The vessel was designed by Henry J. Gielow, naval architect of New York, and is powered with two heavy oil Nelseco engines of 180 horsepower each. The approximate combined weight of these engines is 20 tons. The oil capacity is 6,200 gallons, giving the vessel a cruising radius of over 4,000 miles.

The vessel is 125 feet long overall, 21 feet beam and has a draft of 4 feet, capable of cruising in southern waters during the winter months, and in the north in the summer.

The large deck house on the main deck is approximately 86 feet long. At the forward end a living room is arranged with a stairway down to the owner's suite. The dining room, pantry, servants' lounging and dining rooms and pantry follow. The owner's lounge and smoking room are aft. All sleeping rooms in the owner's quarters, baths and toilet rooms are forward, followed by the engine compartment. The after end is given up entirely to the crew's quarters, which are exceptionally complete, as they include staterooms for the engineers and members of the steward's department, toilet rooms and two shower baths, one for the officers and one for the crew. The captain's quarters are arranged at the after end of the pilot house, with a toilet room and shower bath at the after end.

U. S. Grant Has Successful Sea Trial

THE Army Transport *U. S. Grant,* formerly the *Madawaska,* was given a successful sea trial on Sunday, July 16. The *Grant* left Pier 3, Army Supply Base, Brooklyn, at 9.00 a. m. and proceeded directly to sea, cruising south along the New Jersey coast. At the beginning of the trial, the Filipino firemen, whose previous experience had been confined to Scotch boilers, had some difficulty in learning how to fire watertube boilers.

After they had been shown that the thickness of the fuel on the grates should be from 6 inches to 8 inches rather than from 12 inches to 14 inches, as is desirable on Scotch boilers, and that the back of the grates should be well covered, the steam pressure was raised and the ship made from 14 to 15 knots. It is expected that a speed of 15 knots will be easily maintained when the firemen become accustomed to the boilers.

The principal part of the reconditioning job on the *Grant,* which was done by the Morse Dry Dock & Repair Company, Brooklyn, N. Y., was the removal of three double-ended and one single-ended Scotch boilers and the installation in their place of six Babcock and Wilcox type of watertube boilers. These boilers are fitted for burning coal under forced draft with closed ash pits and open fireroom. Fans are fitted under the back ends of the boilers. Diamond soot blowers of the revolving type are installed on each boiler.

Captain A. B. Fry stated in an interview that "240 tons

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of weight had been saved in the boilers and contained water by the installation of the watertube boilers. Savings in weight, the confinement of possible explosions to the blowing of single tubes and rapid steam generation had made watertube boilers very desirable for passenger ships when a supply of good feed water could be obtained."

Captain Fry also said that "after a thorough inspection of the old Scotch boilers on this vessel they had come to the conclusion that it would not be safe to operate them at a pressure in excess of 187 pounds per square inch which, in his opinion, would have been reduced to 165 pounds at the throttle. As the *Grant's* engines are of the four cylinder quadruple expansion type it was thought desirable to install new boilers working at 225 pounds pressure which would insure dry steam, with some superheat effect, at 205 pounds at the high pressure cylinder.

The *U. S. Grant* is admirably designed for tropical service, having high tween-deck heights. Two new 15-ton York refrigerating machines have been fitted to insure efficient service in the hottest weather.

This vessel, which is 490 feet long, 55.3 feet beam, 25.7 feet depth and 9,410 gross tons, sailed for San Francisco on July 20 carrying a general cargo of merchandise, passengers and troops. Her capacity is 126 cabin passengers and 600 troops and she will enter the Army Transport Service between San Francisco and the Orient.

Among those present on the trial were the following: Colonel L. H. Bash, Colonel A. C. Dalton, Colonel Thayer, Major Rice, Captain Robbins, Captain Ferrand, Captain Moore, Captain Bernard and Superintending Engineer J. T. Stewart of the Army Transport Service; Captain A. B. Fry, U.S.N.; Major F. Van Vleck, consulting engineer; Captain Paul Cantry of Motor Transport Service; F. B. Webster, editor of MARINE ENGINEERING AND SHIPPING AGE; C. H. Want and J. M. Dempsey of the Morse Dry Dock and Repair Company; F. W. Leahy and W. Crawford of the Diamond Power Specialty Company; E. A. Colson and R. D. Bryan of the Babcock and Wilcox Company.

Devices Designed to Cut the Cost of Air Drill Operation

THE lubrication of air drills is not generally considered as one of the items of shop operation subject to the promotion of economy, yet in plants where such tools are used to any great extent, it is necessary to lubricate them at least once a day and in many cases oftener. Certain drills require 15 minutes to lubricate and others as high as 30 minutes. With this fact as a basis, the Chicago Pneumatic Tool Company, Chicago, Ill., carried out an extensive survey of air drill operating costs, which led to the design of an oil vent to prevent air leakage and lessen the necessity of frequently oiling these tools.

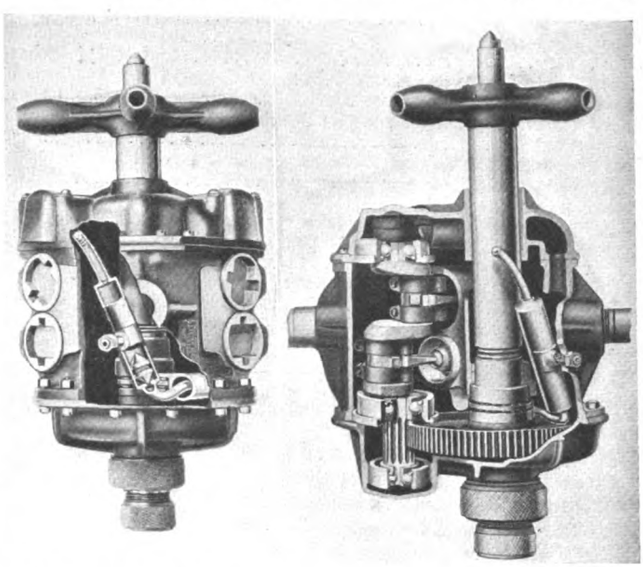
This oil vent is applicable to most sizes and types of "Little Giant" air drills. On new drills it is furnished as regular equipment, and is also attachable to drills now in use. The vent contains a sliding top-shaped plunger which automatically prevents oil leakage regardless of the operating position of the drill.

The estimated saving in time, labor and lubricant based on time and wage factors which are more or less indeterminate is shown by the following comparative figures submitted by the manufacturer:

(1)	Grease per day, ½ pound, at 10 cents per pound	$0.05
	Labor per day, ½ hour, at 60 cents per hour	.30
	Total upkeep per day	$0.35
	Total upkeep cost per six-day week	$2.10
	Less one application per week for machine with vent tube	.35
	Net saving per week	$1.75
	Net saving during 52 weeks	90.00
(2)	Grease per day, ½ pound, at 10 cents per pound	$0.05
	Labor per day, ¼ hour, at 60 cents per hour	.15
	Total upkeep per day	$0.20
	Total upkeep cost per six-day week	$1.20
	Less one application per week for machine with vent tube	.20
	Net saving per week	$1.00
	Net saving during 52 weeks	52.00
(3)	Grease per day, ½ pound, at 10 cents per pound	$0.05
	Labor per day, ½ hour, at 50 cents per hour	.25
	Total upkeep per day	$0.30
	Total upkeep cost per six-day week	$1.80
	Less one application per week for drill with vent tube	.30
	Net saving per week	$1.50
	Net saving during 52 weeks	78.00
(4)	Grease per day, ½ pound, at 10 cents per pound	$0.05
	Labor per day, ¼ hour, at 40 cents per hour	.10
	Total upkeep per day	$0.15
	Total upkeep cost per six-day week	$0.90
	Less one application per week for drill with vent tube	.15
	Net saving per week	$0.75
	Net saving during 52 weeks	$39.00

ONE-PIECE INTERCHANGEABLE TOGGLE

Another new air drill feature applicable to all "Little Giant" air drills is known as the "Invincible" one-piece interchangeable toggle. The toggle bearing and connecting rod are integral and are secured in place in pairs by means of hinged split collars. It is claimed that this feature provides an opening at the top and bottom of the toggle bearing



Section of Vent Tube on "Little Giant" Air Drill **Vent Tube and One Piece Interchangeable Toggles**

which permits the lubricant to come in direct contact with the crank pins. All parts are interchangeable, there being no inside or outside toggle, each being subjected only to the stresses of its own piston. The toggle may be assembled and dis-assembled without dismantling the drill.

ENGINEERS' EMPLOYMENT SERVICE.—An employment service for engineers of every variety of training and experience is conducted by the four National Engineering Societies of the United States. This service brings in touch with the various business men the service of 50,000 trained technical men who are members of these societies. This service is in a position to supply marine, mechanical and designing engineers, trained superintendents and other executives. It is located in the United Engineering Buildings, 29 West 39th Street, New York, under the direction of W. V. Brown and is free to both employer and to employee.

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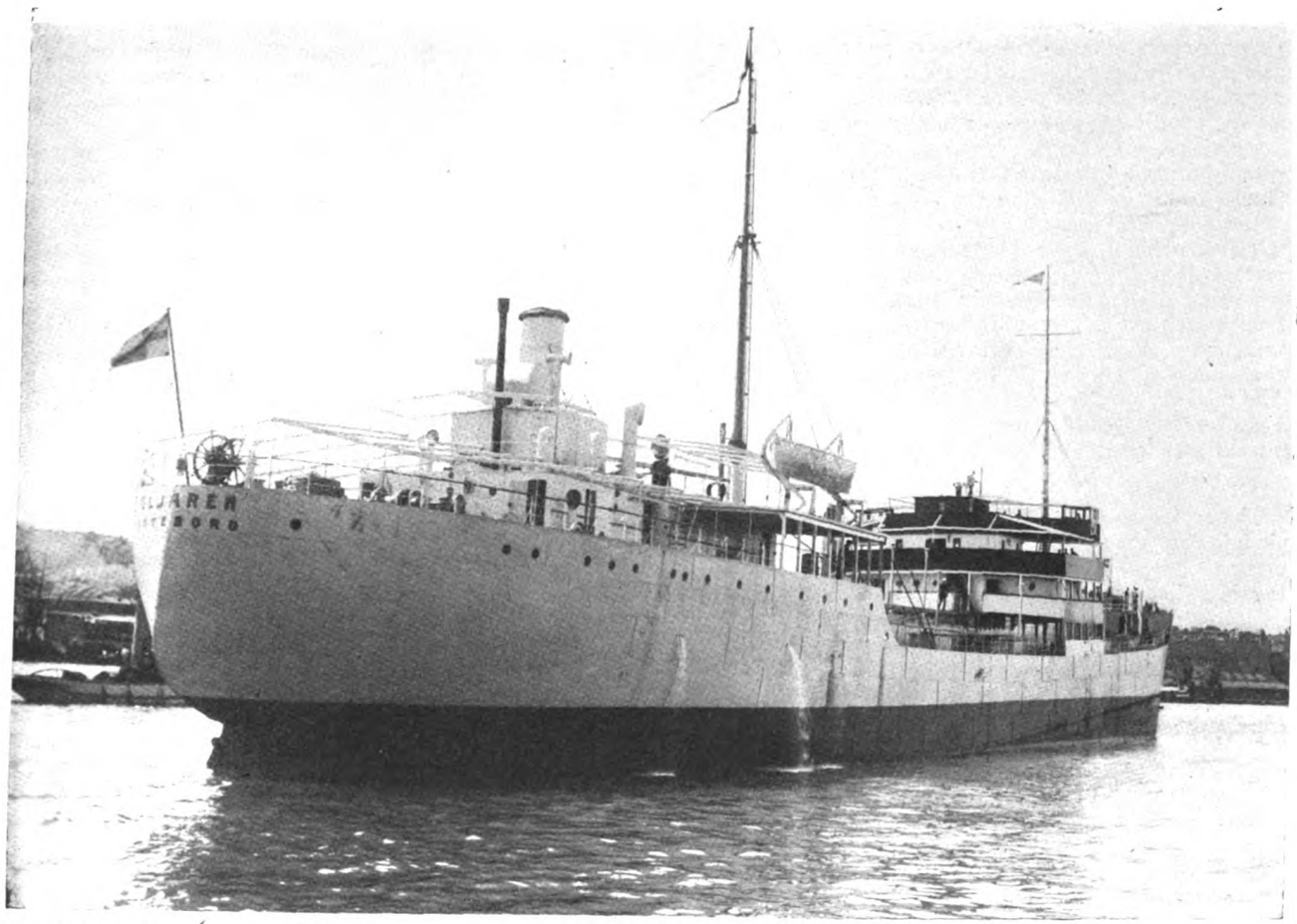

7,500-Ton Motor Tanker Oljaren, Built by Gothenburg Shipbuilding Company for Transatlantic Steamship Company

Motorship Building in Europe

New Type of Double Acting Diesel Engine—New Diesel Electric Ship—A Motor Oil Tanker

By Our Special London Correspondent

SHIPOWNERS in Europe, while admitting the superiority of the oil-engined vessel, are urging manufacturers to produce engines of much lighter construction and lower cost. With this demand in view, a great deal of experimental work has been carried out in various countries with the object of building Diesel or other oil engines less weighty than the existing type and it is a notable fact that the majority of the best-known manufacturers of marine oil engines have recently patented various devices, usually relating to double acting engines on the two cycle or four cycle principle.

A noteworthy development, however, has now been made by the production of a double acting two cycle engine by the North British Diesel Engine Works, a firm which was established for the sole purpose of building Diesel motors. Hitherto they have confined their attention to the four cycle single acting type and machinery of their design was fitted in the passenger liner *Domala*.

They first built an experimental engine of two cylinders designed to develop 240 brake horsepower at 250 revolutions per minute and, having found no troubles, as a result of series of tests they are now constructing a 2,000 brake horsepower three cylinder double acting engine of the same design, which will be installed in a single screw ship.

Scavenging Valves Eliminated and Sliding Cylinders Adopted

At first sight the engine gives the impression of being almost impracticable. The designers started with two main ideas. In the first place they wished to eliminate scavenging valves and to arrange for the scavenging air to pass right through the cylinder from one end to the other. Secondly, they desired to avoid the passage of the piston rod through the lower cylinder cover, since this not only causes trouble with packing glands but also diminishes the output of the engine. They, therefore, adopted the novel idea of having a sliding cylinder and fixed cylinder covers at the top and bottom.

There are scavenging ports at each end of the sliding cylinder, uncovered at the right moment, as the cylinder moves over the cylinder covers. The exhaust ports are in the center, one set for the lower half of the cylinder and one

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for the upper. These are uncovered at the correct timing by the movement of the cylinder relative to the piston. There is no piston rod passing through the cylinder cover but the gudgeon pin is taken out through slots in the cylinder on each side and the drive is arranged on to a forked connecting rod, thus giving one crank per cylinder. The fuel is injected centrally through atomizers arranged in the top and bottom cylinder covers, in which are also located starting valves.

It will be seen from this description that not only does the cylinder with its water jacket reciprocate over the cylinder covers (which are provided with piston rings) but also the scavenging and exhaust branches, which move up and down through gas tight joints in the scavenging and exhaust trunks respectively. This would at first sight appear to be a somewhat clumsy system but the builders state that comparatively little power is needed to drive the cylinders and it must be remembered that oscillating cylinders were used with steam engines some years ago with complete satisfaction.

Weight and Space Reduced 50 Percent

The engine operates on the normal Diesel principle with air injection driving its own scavenging pump and air compressor. Some remarkable claims are made. The weight is said to be exactly half that of a corresponding four cycle engine, while the space needed is also 50 percent and is in fact the same as that required for a reciprocating steam engine without the boiler. It is thought that the cost of construction will be materially reduced and the comparative smallness of the set may be gaged from the fact that the three cylinder 2,000 brake horsepower motor now being built has a cylinder diameter of only 24½ inches and a stroke of 44½ inches.

The completion of the trials of this remarkable experimental engine has come as something of a surprise in engineering and shipbuilding circles in Great Britain and very great interest is being shown in the new development. Incidentally, as indicating the activities in the construction of internal combustion engines, it may be added that there is some likelihood of the production of a rotary marine oil engine in the near future.

Diesel Electric Drive

European shipowners have remained somewhat sceptical regarding the advantages of the Diesel electric drive for ships, as the general opinion appears to be that the cost of installation must be greater and the overall economy somewhat lower than with the direct drive. It is noteworthy, therefore, that an order has been placed with Cammell Lairds of Birkenhead for three new 6,000-ton deadweight vessels in which the Diesel electric system of propulsion will be employed. The ships are for the United Fruit Company of Boston, Mass., and will represent something of a novelty in European motorship construction.

It is especially noteworthy that the propelling plant will consist of four generators driven by Cammellaird Fullagar types of oil engine, which is claimed to be the lightest and smallest internal combustion engine on the market. It is, of course, of the opposed piston design, built in units of two cylinders cast together, diagonal links connecting the upper crosshead of one cylinder with the lower crosshead of the adjoining cylinder.

So far as can be judged there will be little difference in the weight of this Diesel electric plant as compared with the direct drive, since the engines driving the dynamos will naturally be of the high speed type and a great saving in weight will be effected. For instance they will probably run at between 250 and 300 revolutions per minute, whereas marine engines of the same total power would have to operate at not more than 100 to 110 revolutions per minute. It should be added, however, that the general impression in Europe is that while the Diesel electric drive has advantages in special cases, it is not likely to find widespread adoption.

A 7,500-Ton Motor Tanker

An increasing number of motor oil tankers are now being constructed and in addition to the oil transport companies, owners of fleets of cargo motorships are building their own tankers in order to render them to a certain extent independent of the oil transport concerns. One of the finest oil tankers recently turned out is the *Oljaren,* which was completed at Gothenburg by the Gothenburg Shipbuilding Company in June. She is for the Transatlantic Steamship Company, and the intention is to use her to carry oil either to Sweden or any other port where the Transatlantic motorships may bunker. She has a deadweight of 7,500 tons, a length overall of 399 feet 3 inches and a depth of 55 feet. The hull is divided into eleven tanks and in the pump room are installed two 250-ton per hour electrically driven pumps and one of 100 tons per hour. The arrangement is such that electric motors are fitted in the engine room and the shafts driving the pumps pass through the bulkhead dividing the engine room from the pump room.

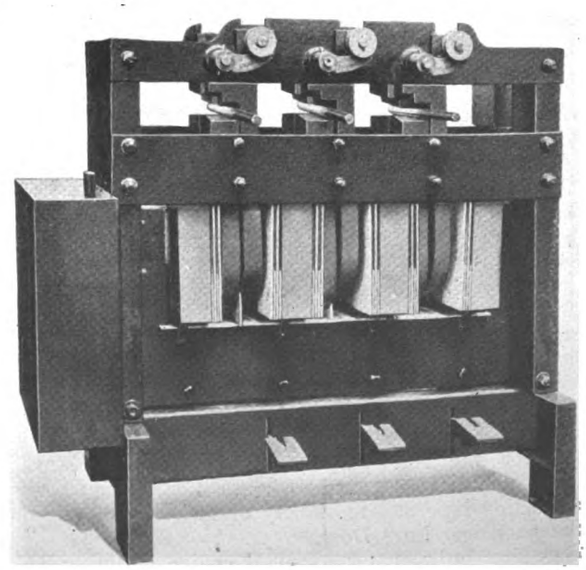
The propelling plant consists of two Burmeister and Wain type oil engines, each of 1,300 indicated horsepower. The auxiliary sets comprise three Diesel driven generators of 75 brake horsepower each driving 50-kilowatt dynamos. All other machinery is electrically operated, but there is a boiler for steaming out the tanks and another for heating the cabins.

The *Oljaren* represents the most modern type of European motor tanker, particularly in the auxiliary arrangement, since it has been customary hitherto to employ steam driven cargo pumps, even in motor tank ships. The daily fuel consumption of this vessel for a speed of about 10½ knots is about 8 tons.

Two Path Electric Heater

A BERWICK electric heater for heating the ends of stock to be used in forging operations has been developed by the American Car and Foundry Company, New York. The heating is accomplished without burning or melting the metal and so that an even heat is distributed through the metal at all times.

The heaters are built with one, two, three and if desired with four or five electrodes. The range of heat runs from 1 inch to 8 inches or from 3 inches to 11 inches, with the



Berwick Electric Heater for Bar Stock

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possibility of increasing the length by slight changes in the standard heater to 16 inches or 18 inches. Stock 3/8 inch to 7/8 inch in diameter may be heated to best advantage on the type machine illustrated, while for larger stock a type 4 machine should be used.

The operation of the heater is along the lines of the Berwick rivet heater. The lower or left hand electrodes are stationary while the upper or right hand electrode is arranged with a vertical adjustment by depression of the foot treadle, which raises the electrode sufficiently to insert or remove the material. Horizontal motion is provided by sliding the electrode clamping device along the shaft provided for the purpose, while as indicated the vertical motion is imparted to the electrode by the depression of the pedal, thus causing the rotation of the shaft, which in turn through cams raises the shaft carrying the electrode.

The material to be heated is inserted between the top and bottom electrodes and due to the double path the time of heating is reduced and the possibility of pitting is not so great. Flexibility of the rear portion of the bottom electrode is provided by the spring shown in the illustration on the rear of the heater, the top face of the electrode being set on an incline so that when the top electrode is dropped in position contact is assured at four points on the material.

Machine for Calking Wood Decks

THE many difficulties generally found in adapting a machine for wood deck calking purposes have been overcome, it is claimed, in an apparatus developed by John McDowall and Sons, Johnstone, near Glasgow, Scotland, known as the "Clyde" deck calking machine. A feature of the machine is an "extended seam" attachment which consists of a hollow guideway so constructed and placed as to form an outward and upward extension of the seam to be calked. Through the tapered opening thus formed by the walls and the guideway, the oakum is compressed by the hammer and enters the seam in a partially compressed state where it is easily driven into place by the point of the hammer. This hammer is tapered to correspond with the walls of the extended seam and the vertically reciprocating stroke is intended to compress the material into a thread of suitable size to be driven into the crack.

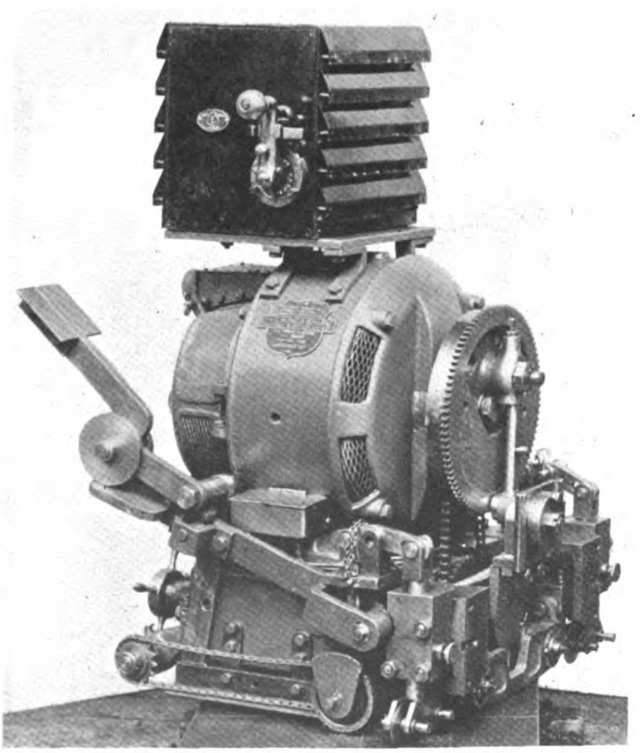

Fig. 1.—Clyde Deck Calking Machine in Position for Traversing

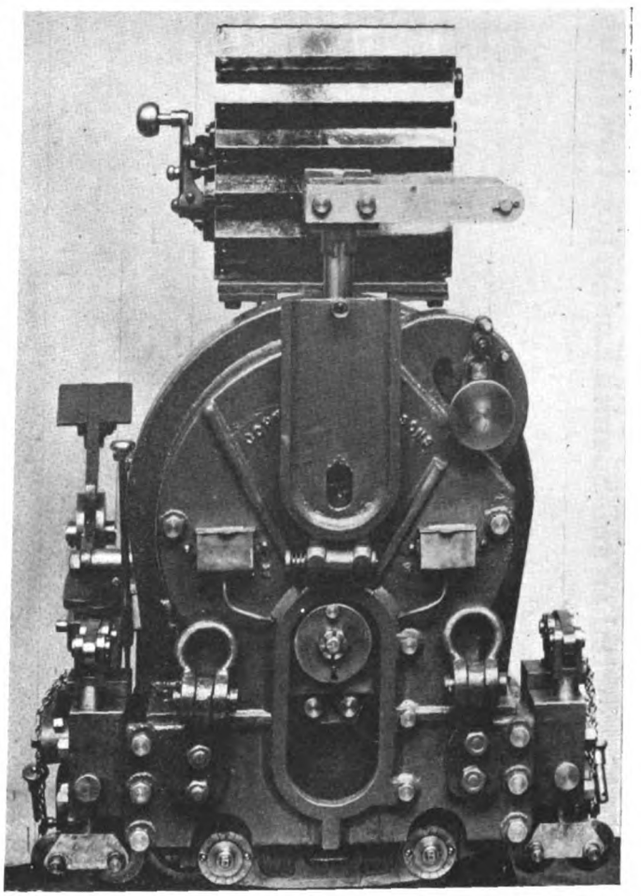

Fig. 2.—Rear View of Calking Machine, Showing Fluted Rollers and Cross Travel Gear

Fluted rollers are fitted to the base of the machine which grip the deck and travel in either direction and which are used for traversing the machine. The calker is kept in alinement with the seam by means of tapered wheels placed in front of and behind the hammer. These wheels adapt the operation to the many irregularities found in even the best laid planking. The oakum thread is wound upon a bobbin which carries about 450 feet, the supply to the tool being automatic.

A special 3 brake horsepower reversing motor, which can be wound to suit either direct or alternating current, furnishes power to the machine. A reversing controller is mounted on the top of the motor as well as the necessary electrical resistance.

A cross-travel gear, operated by means of a foot lever, is also fitted to the machine for the purpose of shifting from seam to seam. When the foot pedal is depressed the machine is lifted on to the wheels placed to travel at right angles to the seam and by the same operation the seam guide wheels are lifted clear of the deck. A handle is then used to wind the machine across to the next seam. When the machine is again in position the oakum is threaded with a special tool and the calker is ready to start.

With the controller thrown in the machine runs without attention until it reaches the end of the seam automatically drawing the oakum as required from the bobbin. The machine will operate in either direction by simply throwing over the controller handle and altering the lead of the oakum.

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Passenger Ship Requirements from American, British, French, German, Italian and Spanish Emigration Laws; also United States Lines' Practice

	U. S. STEAMBOAT INSPECTION SERVICE		BRITISH BOARD OF TRADE	FRENCH	GERMAN	ITALIAN	SPANISH	U.S. LINES' PRACTICE The Practice of the U. S. Lines Is to Provide Comfortable Rooms for Third Class Passengers and Is as Follows:
	Passengers	Crew						
Baggage space	.....	.....	.....	.....	17.6 cu. ft. per person.	.....	.....	Sufficient baggageroom space.
Bath and washrooms	Sufficient number.	Separate washrooms for deck and engine departments. 1 wash basin for every two men on watch. Sufficient number of baths.	5 basins per 100 3rd cl. passengers; 1 wash trough for every 100 women; 1 wash trough for every 200 men; 3 basins per 100 passengers when basins are fitted in rooms; 1 bath tub per 100 women; 1 bath tub per 100 men (half may be showers)	.....	1 washroom for men and 1 for women; 2 wash basins per 100 passengers; bath and showers required if vessel sails below 30° north latitude; washrooms not required where basins are fitted in rooms.	1 washroom each, men and women, forward; 1 washroom each, men and women, aft; 5 laundry tubs for each washroom; 2 wooden tubs of at least 13-gallon capacity, additional; sufficient bathtubs, showers and basins.	.....	1 wash basin and toilet cabinet in each 2 or 4 berth s.r.; 2 in each 6-berth room; 3 basins in washrooms for every 100 passengers; 1 wash trough for every 100 women; 1 wash trough for every 200 men; 1 bathtub for every 100 women; 1 bathtub for every 200 men; 1 shower for every 200 men.
Berths	Size, 2'x6'; height over deck, 6"; height between berths, 2' 6"; height under deck, 2' 6". Two tiers of berths, only, regardless of deck height. To be separated by partial partitions.	Size, 2'x6'; height over deck, 6"; height bet. berths, 2' 6"; height under deck, 2' 6"; two tiers of berths only.	Size, 22"x6'; height over deck, 12"; height between berths, 2' 6"; height under deck, 2' 6"; two tiers of berths only.	Size, 22 1/2" x 6'; height over deck, 5 7/8"; height between berths, 2' 3 1/2"; sufficient number of berths required 2' 7 1/2" in width.	Size, 23 5/8"x6'; height over deck, 5 7/8"; hght. under deck, 2' 5 7/8"; two tiers of berths only to be separated by low boards.	Size, 22 1/2" x 5' 10 7/8"; height over deck, 15 3/4"; height between berths, 2' 3 1/2"; height under deck, 2' 3 1/2"; 10% of berths in all compartments to be 2' 7 1/2" in width.	Size, 19 11/16" x 5' 10 7/8"; 6% in women's compartments to be 2' 7 1/2"x6'; height over deck, 15 3/4"; height between berths, 23 5/8"; 3 high allowed when deck height is over 7' 6 1/2".	Size. 2' 2"x6' 3"; height over deck, not less than 18"; height bet. berths, not less than 2' 6"; height under deck, not less than 2' 6"; min. size of 4 berth room, 7' x 6' 4"; min. size of 2 berth room, 4' 9"x6' 4"; leeboards provided for all berths.
Deck space below	36 sup. ft. for every 1st cl. passenger, 18 sup. ft. for every 3rd cl. passenger, above lowest passenger deck; 21 sup. ft. for every 3rd cl. passenger on the lowest passenger deck. *Where allowance is made for public rooms:* 15 sup. ft. for every 3rd cl. passenger above the lowest passenger deck; 18 sup. ft. for every 3rd cl. passenger on the lowest passenger deck.	16 sq. ft. for each seaman; 120 cu. ft. for each seaman.	36 sup. ft. for every 1st cl. passenger; 15 sup. ft. for every 3rd cl. passenger above the lowest passenger deck. 18 sup. ft. for every 3rd cl. passenger on the lowest passenger deck. *Where allowance is made for public rooms:* 12 sup. ft. for every 3rd cl. passenger above lowest passenger deck. 15 sup. ft. for every 3rd cl. passenger on the lowest passenger deck.	Main deck: 97.1 cu. ft. per 3rd cl. passenger. Lower decks: 105.9 cu. ft. per 3rd cl. passenger.	100.6 cu. ft. per 3rd cl. passenger (considering 7.87' as a maximum deck height.)	Main deck: 97.1 cu. ft. per 3rd cl. passenger. Lower decks: 105.9 cu. ft. per 3rd cl. passenger. (Considering 8.2' as a maximum deck height).	97.1 cu. ft. per 3rd cl. passenger. (Considering 8.2' as a maximum deck height).	Greater deck space than required in the various emigration laws is provided as third class passengers are carried in rooms.
Deck heights	6'.	.....	6'	.....	6'	7' 2 9/16".	7' 6 1/2" where berths are 2 high.	.....
Deck space, promenade	5 sq. ft.	.....	5 sq. ft.	.....	2.68 sq. ft.	4.84 sq. ft.	4.84 sq. ft.	Not less than 5 sq. ft. per person.
Doors	.....	.....	Equal in width to stair ways to which they give access.	.....	.....	2' 7 1/2".	.....	Not less in width than stairways to which they give access. Fixed blinds in s.r. doors for exhaust vent.; min. size of doors, 6' 6"x2' 2".
Hatches	.....	.....	.....	.....	.....	To be covered with wooden gratings on main deck and above in addition to hatch covers.	.....	.....
Hatches, booby	To be fitted on all ladders opening into the weather. 6" coaming required.	.....	Hinged flaps and doors not acceptable. Must be of substantial hood type.	.....	.....	.....	.....	Booby hatches to be fitted on all ladders opening into the weather.

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						Hooby hatches to be fitted on all ladders opening into the weather.		
Hospitals	Two compartments. 1 for men, 1 for women. 18 sup. ft. deck space for every 50 passengers carried.	1 compartment; 1 berth for every 12 seamen, provided that not more than 6 berths are required.	Three compartments; 1 for men, 1 for women, 1 isolation hospital. General Hospitals: 24 sup. ft. for every 50 passengers carried; 96 sup. ft. total deck area.	3 compartments: 1 for men, 1 for women, 1 isolation hospital. General Hospitals: 1 berth every 40 persons up to 200; 1 berth every 60 persons over 200; 141.25 cu. ft. per person. Deck height, 6'.	2 compartments: 1 for men, 1 for women, 2 berths for every 100 passengers; 176.55 cu. ft. per person; 3' 4" clear space alongside of each berth.	3 compartments: 1 for men, 1 for women, 1 isolation hospital, berths to number 2% and 1% respectively of the total number of passengers carried. 123.59 cu. ft. per person.	3 compartments: 1 for men, 1 for women; 1 isolation hospital; berths to number 4% of the total number of passengers; 123.59 cu. ft. per person.	3 compartments: 1 for men, 1 for women, 1 isolation hospital; 24 sup. ft. for 50 passengers, or 48 sq. ft. per hospital, or 2 berths per 100 passengers; 3' 4" clear space alongside each berth.
Lighting	Sufficient electrical illumination.	.....	Sufficient electrical illumination.	.....	2 standard electric light fixtures and 2 emergency lights for every 100 passengers.	6 to 10 electric lights in each compartment; 4 to 6 emergency lights in each compartment; 2 electric lights in every hatch trunk used for access.	.....	1 electric light in each stateroom: 10-12 electric lights in passages of each compartment; 4-6 emergency lights in each compartment; 2 electric lights in each hatch trunk used for access.
Passages	.....	.....	Not less in width, between cabins, than inside measurement of berth.	.....	2'3⅝"	2' 7½".	2' 3⅛".	2' 6" clear for main passageways.
Rails	.....	.....	6" max. clearance between rails on open deck.	.....	.....	.....	2'3⅝" between cabins.	2' 3" clear for thwartship passageways.
Air ports	Sufficient number.	.....	At least 9" in diameter.	.....	Sufficient number.	Not required on lower deck, but 2 Utley's patented ventilating ports must be fitted in every compartment.	.....	6" maximum clearance between rails on open deck and access ladders.
Stairways	Sufficient number.	.....	2" width for every 5 passengers carried in a compartment.; 30"-50" clear breadth for single and double stairways respectively; 6' clear headroom above each stair; 37° heel where possible.	Width, 2' 7½"; 1 stairway for 50 passengers; 2 stairways for 50 to 150 passengers; 3 stairways for 150 to 200 passengers; 4 stairways for 200 or over.	Clear breadth, 2' 7⅛"; 1 for 100 passengers or less; 1 for every 100 passengers up to 400; 1 for every 150 passengers over 400. (Not less than four).	Clear breadth, 2' 7½"; 1 stair for 1 to 50 passengers; 2 stairs for 51 to 150 passengers; 3 stairs for 151 to 200 passengers; 4 stairs for 200 and above; 1 stairway must lead to clear deck for every 100 passengers carried below. 35° heel.	Width, 2' 3⅛"; 1 permanent stairway that can be used while loading or discharging cargo.	Staterooms arranged so that there is at least one port light in each outboard room and one each at ends of thwartship passageways. 2" width for every 5 passengers carried in a compartment; 30"-50" min. clearance for single and double stairways, respectively; not less than 6' clear headroom above each stair. Rake, 42° where practicable.
Ventilation, natural	2 ventilators, 12" dia. for every 50 passengers.	.....	5 sq. in. area per passenger; 2 vents for 75 passengers and under; 3 vents for 76-125 passengers and under; 4 vents for 126 or more passengers and under; diameters, 10" min., 20" max.; ventilators not to exceed 314 sq. in. in area.	Sufficient ventilation	2 vents, 11⅛" in dia. in each compartment carrying 100 passengers where more than 100 passengers are berthed in one compartment, the number of vents will be increased proportionally.	2 vents each .75 sq. ft. area for 50-100 persons; 3 vents each .75 sq. ft. area for 101-200 persons; 4 vents, each .75 sq. ft. area for 201 or more; ventilators of larger area than .75 sq. ft. count only as one ventilator.	1 vent, 7⅞" dia. for 25 to 100 persons; 2 vents, 7⅞" dia. for 100 to 200 persons; 4 vents, 7⅞" dia. for 200 or more persons. *Where vent area is less than above:* Only 90% of the passengers may be carried.	To conform to all emigration laws.
Ventilation, forced	.....	.....	When ventilation is mechanical at least 830 cu. ft. of air per hour must be delivered for each passenger.	.....	.....	Every compartment on lower deck must have at least 2 independent electrical sup. blowers of 1,765.5 cu. ft. per minute capacity.	.....	Forced ventilation used throughout; ducts with louvre controls to be led to each stateroom.
Water	4 quarts per day per 3rd class passenger.	Sufficient quantity.	4 qts. per day per 3rd cl. passenger; ample amount to cabin passengers and crew; 10 gals. per day for cooking purposes for every 100 persons on board.	.....	.....	.....	.....	1 drinking fountain in each 3rd cl. compartment. 5 gals. per day per 3rd cl. passenger.
Water closets	At least two. 1 w. c. for every 100 men. 1 w. c. for every 50 women.	Sufficient number.	4 w.cs. for every 100 passengers up to 300; 2 w.cs for every additional 100; 2 urinals for every 100 male passengers up to 300. 1 urinal for every 100 passengers beyond that number. Trough type not allowed.	2 w.cs. for 100 passengers and under; 1 w.c. for every additional 75 passengers.	1 w.c. for every 50 passengers.	2 w.cs. for 1st 100 passengers; 2 w.cs. for every 150 passengers beyond that number.	Men w.cs. / Women w.cs. / No. of Pass. 2 / 1 / 100 or less 3 / 2 / 100 to 250 5 / 2 / 250 to 450 6 / 3 / 450 to 700 8 / 4 / 700 to 1,000 1 / 1 for every additional 200 passengers.	4 w.cs. for every 100 passengers up to 300; 2 w.cs. for every additional 100 passengers; 2 urinals for every 100 male passengers up to 300; 1 urinal for every 100 passengers over 300; ratio: men and women carried, 3:2. All w.cs. are individual.

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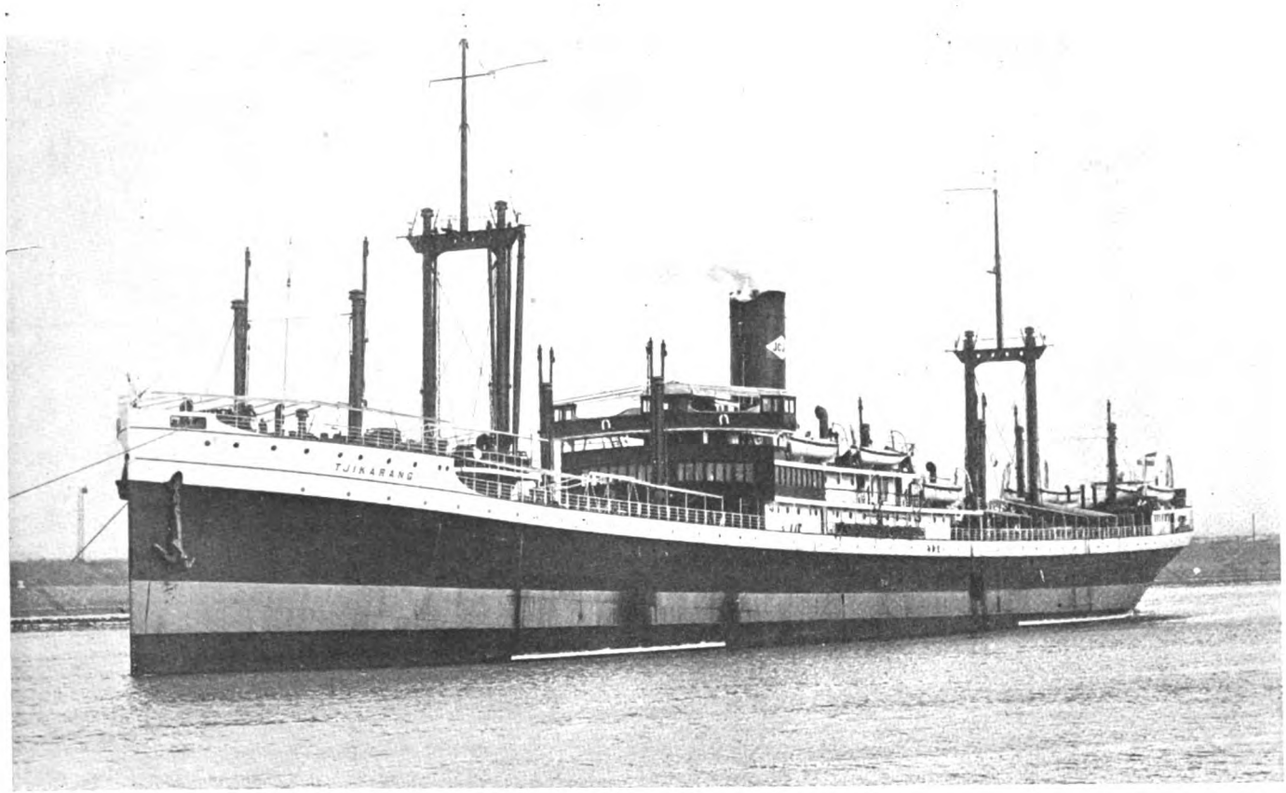


S. S. Tjikarang, Built for the Java-China-Japan Line by the Netherland Shipbuilding Company, Leaving Amsterdam for Her Trial Trip

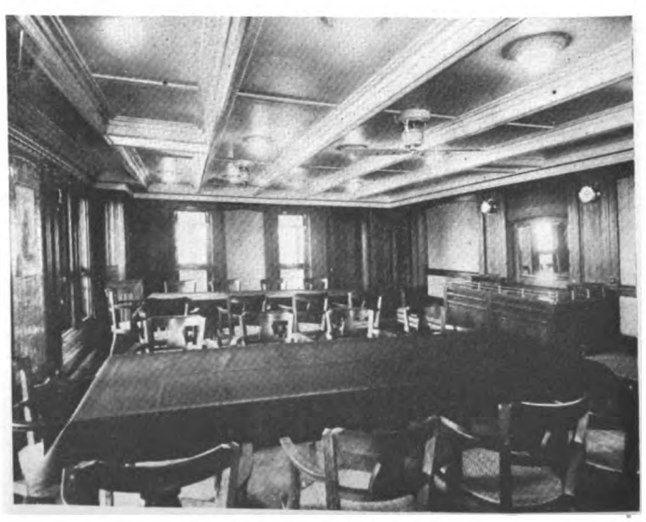
Cargo Steamer Tjikarang Has Limited Passenger Accommodations

WHAT is said to be the largest cargo steamer ever built in Amsterdam, Holland, was completed early this year by the Nederlandsche Scheepsbouw-Maatschappy (Netherland Shipbuilding Company) for the Java-China-Japan Line, Batavia. The *Tjikarang,* as the vessel is named, has a length of 485 feet, a beam of 60 feet, a depth of 40 feet 6 inches and a deadweight capacity of 13,175 tons. Although a cargo steamer, the *Tjikarang* has accommodations for 12 first class passengers, consisting of a dining saloon, smoking room, staterooms for one and two persons, bath rooms, etc. In the 'tween deck space there is room for 1,800 natives.

The vessel has two double masts, 8 derrick posts and also a derrick of 30 tons' capacity. Cargo is handled by means of 20 steam winches. The vessel is electrically lighted, has a steam heating installation and cooled provision holds.

Propulsion is by a triple expansion engine of 5,000 indicated horsepower supplied by Werkspoor of Amsterdam, designed to give the vessel a speed of 12½ knots. The vessel was built to Lloyd's highest class.

Smoking Room



First Class Dining Saloon

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The New M. A. N. Diesel Engine

Four Cycle Type Now Being Built in Germany —First Units to Be Installed on Hansa Freighter

By Our Special London Correspondent

IT is a remarkable fact that oil engine builders in Germany, which was originally the home of the two cycle Diesel engine, are now for the main part reverting to four cycle machinery. It is believed this is largely due to the failures of the two cycle engines in submarines during the war and the undoubted success of the four cycle design, particularly that built by the M.A.N. This concern has now developed a four cycle marine type for cargo ships, the design being quite different in many respects from other engines of this class. It is standardized as a 1,600 brake horsepower plant and twin screw sets will be installed in many of the new German motorships which are now being constructed in the rebuilding of Germany's mercantile fleet.

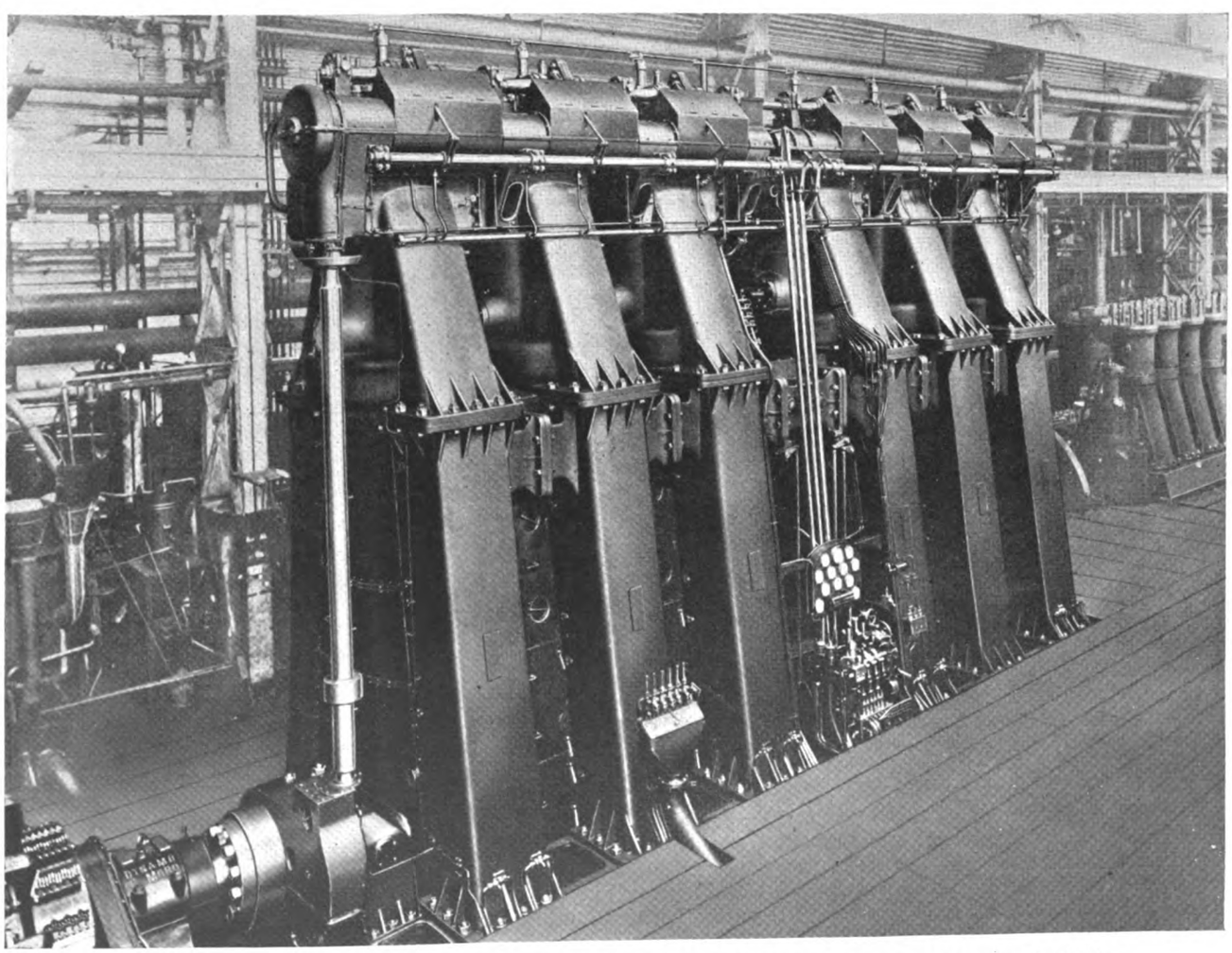
To Run on Boiler Fuel Oil

It has six cylinders 700 millimeters by 1,200 millimeters and runs at 100 revolutions per minute. It is of the air injection type, but instead of driving the air compressors at the end of the engine, as is now common, they are operated from beam levers, two three-stage air compressors being fitted.

The engine is designed to run on boiler fuel oil or, if necessary, on tar oil, as this latter can be obtained at moderate prices in Germany. In order to accomplish this the designers have carried out an idea that has been utilized in Germany with land engines for some years past. A small quantity of lighter oil is allowed to enter the cylinder through the fuel valves just before the piston reaches the top of its stroke and prior to the admission of the main body of the fuel oil. With the rise in pressure consequent upon the ignition of this small quantity of light oil, the temperature is raised sufficiently to allow the heavier fuel to be satisfactorily burned.

Method of Cooling Cylinder Cover

The builders have evolved a cylinder cover design which appears to be peculiarly efficient. Since cylinder cover cracks, when they occur, naturally develop in the section of the cover next the point of maximum temperature (that is



First of the New Four Cycle M. A. N. Diesels of 1,600 Brake Horsepower Erected at the Builders' Shop

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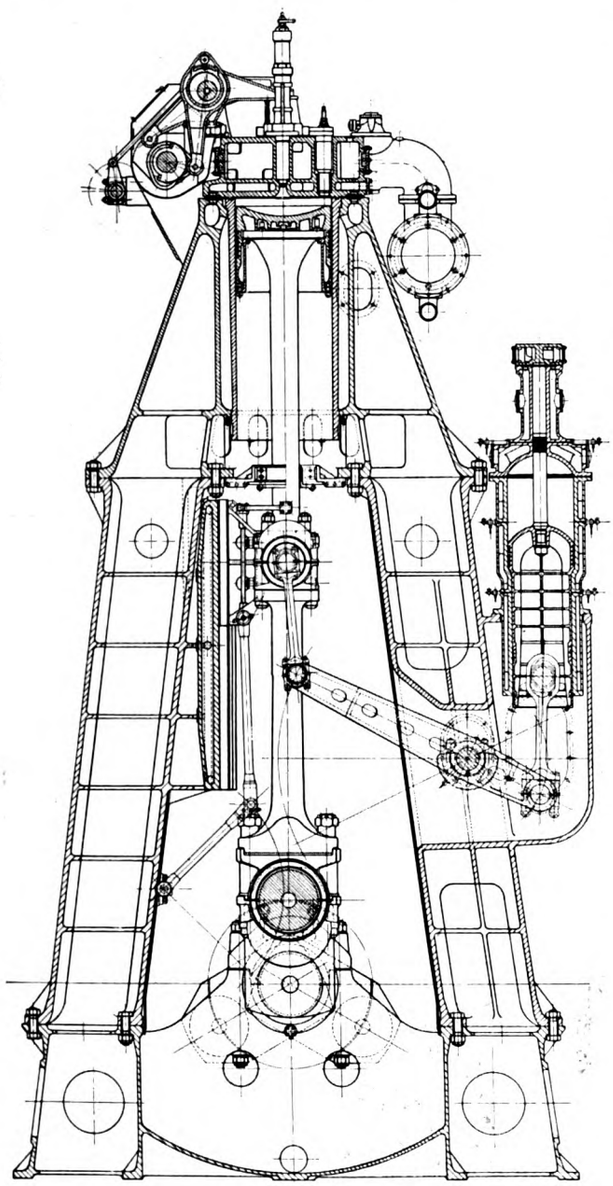
to say, close to the fuel valve), it is of the utmost importance that the cover should be effectively cooled at this section. In order to accomplish this, the builders of the M.A.N. engine have arranged that the speed of the cooling water around the fuel valve shall be greater than in other parts of the cover where the cooling effect is not so essential. They have therefore divided the cylinder cover by a horizontal partition wall and through the lower half the cooling



Section of New M. A. N. Engine

water passes with fairly high velocity. It is allowed to enter the upper section of the cylinder cover through holes cut in the division wall.

Pistons Cooled With Lubricating Oil

It is somewhat surprising to find that the pistons are cooled with lubricating oil instead of water. A flange is forged on the top of the piston rod and this is pressed up against ribs cast within the piston crown. The joint between the crown and the piston flange is maintained through a bush as indicated on the sectional drawing. The ribs on the piston crown, besides giving ample surface for the cooling oil, are so arranged that the oil, flowing up through a hole in the piston rod, passes to the outer section and then through the various divisions formed by the ribs before being discharged from the engine through a tube in the center of the piston rods.

A very rigid form of cylinder cover construction is adopted, each cylinder being supported from two columns, while the columns themselves are joined together with bolted flanges at the top. The cylinder jackets are splayed out at the bottom for attachment on the flanges of the columns, and the bearings carrying the camshafts are supported from the cylinder structure.

Valve Mechanism

The camshaft is driven from the crankshaft through bevel gearing and vertical spindle as seen in one of the illustrations. There are ahead and astern cams for actuating the fuel, starting, exhaust and inlet valves and the camshaft is moved in a longitudinal direction when reversing. The reversing mechanism is operated through the usual oil servo motor, control for which is effected from the engine room floor level.

There are two levers, each controlling three cylinders, and the normal method of starting up is adopted by which six cylinders are placed on starting air, then, three are turned over to fuel oil and finally all six switched over to oil. A hand starting and maneuvering mechanism is provided in the event of failure of the servo motor gear.

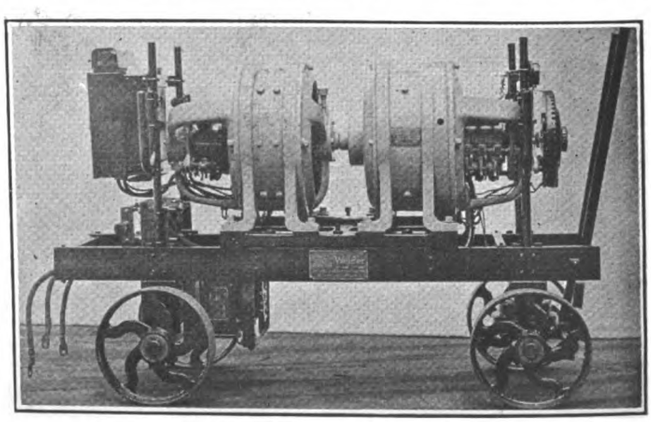
Over the top of the crankcase for each cylinder is a tray which collects the lubricating oil that may fall from the piston, this being delivered through filters and used over again.

The first two engines are to be installed in a motor cargo ship of about 6,500 tons gross, now being built for the Hansa Line.

A Large Capacity Welding Set

A PORTABLE welding outfit of increased capacity is now being built by the U. S. Light & Heat Corporation, Niagara Falls, N. Y. It consists of a motor-generator set and control apparatus mounted on a four-wheel hand truck.

The generator has a continuous capacity of 300 amperes, and for cutting and other work of an intermittent nature will develop 400 amperes. It is designed with inherent regulation and has the same characteristics as the 200-ampere machine made by the same company. The generator is also furnished for belt or gas engine drive.



The 350-Ampere U. S. L. Welding Set

The set is supplied with either a direct or alternating current motor and weighs complete about 1,700 pounds.

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United States Navy's Research of Ship Bottom Paint

By N. E. Adamson*

The following article has been prepared from the author's notes on research pertaining to ship bottom paints during the past 12 years, augmented by data drawn from the files at the Norfolk Navy Yard, where most of the Navy's research on this subject has taken place. Because of the great volume of data, a brief description of the tests and the history of the research is given rather than a technical discussion of the subject. For obvious reasons the trade names of proprietary paints and materials are omitted.

TWENTY years ago the Navy used commercial ship bottom paints, purchasing them after the receipt of competitive bids. In order to submit bids for ship bottom paints it was necessary that a manufacturer succeed in getting his paints recognized at the Navy Department and listed as acceptable. The paint used was therefore limited to certain brands and, of these, two or three became more extensively used than the others.

It soon developed that each Navy Yard, where ship bottoms were painted, was forced to maintain stocks of varnish, grease and soap paints of various brands. If a bottom had been painted with a grease paint and required repainting, it was necessary again to use a grease paint or clean off all the old grease paint before applying a spirit varnish paint. Failure to do this was believed to invite unfavorable results from the last applied paint. The docking of ships had to be anticipated sufficiently in advance to allow the yard time to procure the particular brand of paint needed if it was not on hand. It was therefore not unusual to have a supply of anti-corrosive and anti-fouling paints from six different manufacturers in a yard at one time.

It does not appear that the cost of ship bottom paints was considered further than in awarding contracts. The costs of the paints, in general, were approximately $2.10 per gallon for anti-corrosive and $3.25 per gallon for anti-fouling paint. Some paints were purchased by the pound or hundredweight, the costs being approximately $0.20 and $0.30 respectively per pound or $21 and $33 respectively per hundredweight. The saving that the Navy could realize in "first costs" does not seem to have been advanced as a reason for undertaking the manufacture of ship bottom paints, and the fact that a very great saving could be realized only became apparent after the manufacture started, or six years after the first steps were made toward developing formulæ. In the beginning, the manufacture of ship bottom paints by the Navy Department was an effort to standardize—to make it possible to have all the bottoms painted with the same paints so as to require a minimum of paint in stock at Navy Yards and that paint of a constant quality available for any ship's bottom.

*Assistant shop superintendent, United States Navy Yard, Norfolk, Va.

Problems Presented on Starting to Manufacture Ship Bottom Paints

The first official action toward this standardization appears in a Navy Department (Bureau of Construction and Repair) letter dated February 13, 1902 and addressed to the Commandant, Navy Yard, Norfolk, Va. In this letter the bureau requested the commandant to direct the naval constructor to consider the advisability of manufacturing, for the Navy's use, a bottom paint of good quality and to report concerning the cost of establishing a factory for producing the paint in large quantities.

At this time, Rear Admiral C. S. Cotton, U.S.N., was

Table 1—Compositions of the First 21 Experimental Paints Used in Deriving Formulae for U. S. Navy Ship Bottom Paints. A. C. Denotes Anti-Corrosive Paint. A. F. Denotes Anti-Fouling Paint

PERCENT OF COMPOSITION BY WEIGHT [APPROXIMATE]

Formula Number	Wood Alcohol	Grain Alcohol	Gum Shellac	Zinc Oxide, dry	Indian Red, dry	Venetian Red, dry	Glycerine	Creosote	Gum Mastic	Pine Tar Oil	Arsenic	Turpentine	Zinc Sulphate	Corrosive Sublimate	Boiled Linseed Oil	Mercuric Oxide	Benzine	Metallic Zinc (Zinc Dust)	Bitter Aloes	Mercuric Cyanide
1-A.C.	35.6	...	4.9	40.5	19.3	...	2.5	0.7	...	...	...	...	...	...	...	...	...	...	...	...
2-A.F.	36.8	...	5.5	22.2	...	22.2	...	0.7	0.7	11.5	0.7	...	...	...	...	...	...	...	...	...
3-A.C.	...	28.2	12.7	33.9	8.5	...	...	...	...	8.8	...	7.7	...	...	...	...	...	...	...	...
4-A.F.	...	19.6	5.9	23.6	...	23.6	...	...	...	12.3	...	10.7	2.9	1.5	...	...	...	...	...	...
5-A.C.	...	28.2	12.7	42.4	...	...	...	...	...	8.9	...	7.7	...	...	...	...	...	...	...	...
6-A.C.	...	42.3	8.4	16.1	...	...	...	...	...	16.7	...	...	...	..	16.2	...	...	...	...	...
7-A.F.	...	25.4	11.8	15.5	...	7.8	...	...	...	16.4	1.9	21.1	...	...	...	...	...	...	...	...
8-A.F.	...	19.6	5.9	23.6	...	23.6	...	...	...	12.3	...	10.7	2.9	...	...	1.5	...	...	...	...
9-A.F.	...	20.0	6.0	24.0	...	24.0	...	...	...	12.5	...	0.7	...	...	...	0.8	11.8	...	...	...
10-A.C.	...	28.3	12.8	34.0	8.5	...	...	...	...	8.9	...	...	...	...	...	...	7.6	...	...	...
11-A.F.	...	19.6	8.9	23.6	...	23.6	...	...	...	12.3	...	...	...	0.8	...	0.7	10.5	...	...	...
12-A.C.	...	23.4	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	64.3	1.7	...
13-A.F.	...	37.4	7.5	...	...	15.0	...	...	...	...	...	13.8	3.7	...	...	...	...	15.0	3.8	3.7
14-A.C.	...	28.7	6.6	10.8	...	...	...	...	...	...	...	15.5	...	...	...	...	...	38.7	...	...
15-A.C.	...	37.8	8.5	12.8	...	...	...	...	...	...	...	2.7	...	...	...	...	...	38.3	...	...
16-A.C.	...	37.8	8.5	25.6	...	...	...	...	...	...	...	2.7	...	...	...	...	...	25.6	...	...
17-A.C.	...	37.6	8.0	37.9	...	...	...	...	...	...	...	2.5	...	...	...	...	...	14.1	...	...
18-A.C.	...	43.3	10.2	32.5	...	...	...	...	...	7.5	...	6.6	...	...	...	...	...	...	...	...
19-A.F.	...	30.5	13.5	18	...	18	...	...	...	9.6	...	8.1	...	...	...	2.2	...	...	...	...
20-A.F.	...	37.0	8.3	27.7	...	...	...	...	...	23.3	...	...	...	3.7	...	...	...	...	...	...
21-A.F.	...	31.5	9.4	18.9	...	...	...	...	...	9.8	...	8.7	...	3.1	...	...	...	...	...	...

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Table 2—Composition and Tests of Second Series of Experimental Paints Used in Deriving Formulae for U. S. Navy Ship Bottom Paints. A. C. Denotes Anti-Corrosive Paint. A. F. Denotes Anti-Fouling Paint

PERCENT OF COMPOSITION BY WEIGHT (APPROXIMATE)

Formula Number	Beef Tallow	Bees Wax	Chrome Green	Lampblack (in Oil)	Copperas	English Rosin	Laundry Soap	Mercuric Oxide	Methyl Alcohol	Gum Shellac	Zinc Oxide	Indian Red	Pine Tar Oil	Turpentine	Venetian Red	Grain Alcohol	Gum Elemi	"Burning Pitch"	Zinc Dust	Corrosive Sublimate	Gum Sandarac	Sulphur	Spar Varnish	Gum Euphorbium	Arsenic	Rosin	Zinc Sulphate	Boiled Linseed Oil	Japan Drier	Period of Test	Results
22-A.F.	22.2	6.7	11.2	6.7	4.4	40.0	7.8	1.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4 months.	Good. Few barnacles.
23-A.C.	...	...	...	...	...	...	...	...	51.1	8.7	23.0	6.5	6.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	Put on bottom that did not dock here again. No data.
24-A.F.	...	...	...	...	...	...	...	1.0	36.0	8.1	18.6	...	10.5	7.2	18.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
25-A.C.	...	...	...	...	...	...	...	...	...	9.8	19.5	9.8	11.1	7.5	...	32.9	9.8	...	...	...	...	...	...	...	...	...	...	...	...	No record.	Plate test gave unsatisfactory results.
26-A.F.	...	...	...	...	...	...	...	2.0	...	23.8	...	...	...	...	17.8	40.0	...	5.9	...	...	...	...	...	...	...	...	...	...	...		
27-A.C.	...	...	...	...	...	...	...	...	...	3.7	22.0	7.3	...	22.8	...	37.0	7.3	...	...	...	...	...	...	...	...	...	...	...	...	Jan. 19, 1907, to Mch. 17, 1907.	Plate test. Excellent condition. No grass, barnacles or blisters.
28-A.F.	22.0	6.6	11.0	6.6	4.4	39.6	7.7	2.2	...	...	...	...	...	...	...	9.2	...	...	...	...	...	...	...	...	...	...	...	...	...		
29-A.F.	...	...	...	...	...	...	...	1.4	...	13.5	18.2	18.2	10.4	.9	...	39.0	...	...	...	...	...	...	...	...	...	...	...	...	...	Feb. 13, 1907, to May, 1908.	Tested on U. S. S. Hornet. Excellent condition. Few barnacles and patches of grass.
30-A.C.	...	...	...	...	...	...	...	...	...	8.3	15.2	5.2	10.0	...	...	53.5	...	...	6.9	...	...	...	...	...	...	...	...	...	...		
31-A.F.	...	...	...	...	...	...	...	...	...	13.5	18.2	18.2	10.0	9.2	...	30.2	...	...	...	0.8	...	...	...	...	...	...	...	...	...	Same as 29.	Same as No. 29.
32-A.C.	...	...	...	...	...	...	...	...	...	11.4	11.4	5.7	12.8	11.4	...	35.7	...	...	...	...	11.4	...	...	...	...	...	...	...	...	Mch. 18, 1907, to May 24, 1907.	Plate test. Results unsatisfactory.
33-A.F.	...	...	...	...	...	...	...	...	...	8.5	...	...	9.5	5.6	54.0	14.3	...	...	...	...	...	2.1	3.7	...	...	...	...	...	...		
34-A.C.	...	...	...	...	...	...	...	...	...	14.1	19.0	...	...	...	...	32.1	...	...	19.0	...	...	...	...	14.1	...	...	...	...	...	4 months.	Plate test. Very good results. No fouling but a few blisters.
35-A.F.	...	...	...	...	...	...	...	4.9	...	9.8	13.2	...	...	...	26.2	22.9	...	...	13.2	...	...	...	...	9.8	...	...	...	...	...		
36-A.F.	...	...	...	...	...	...	...	...	...	10.0	13.5	...	...	...	26.9	23.6	...	...	13.5	2.5	...	...	...	10.0	...	...	...	...	...	4 months.	Plate test. Results very good.
37-A.F.	...	...	...	...	...	...	...	4.6	...	9.0	12.0	...	...	...	24.1	21.0	...	...	12.0	2.3	...	...	...	9.0	6.0	...	...	...	...	4 months.	Plate test. Results good.
38-A.F.	...	...	...	...	...	...	...	...	...	41.0	...	20.5	...	...	...	36.0	...	...	...	2.5	...	...	...	...	...	...	...	...	...	Mch. 26, 1907, to May 24, 1907.	Plate test. No fouling.
39-A.C.	...	...	...	...	...	...	...	...	...	11.8	47.0	...	13.8	...	...	27.2	...	...	...	...	...	...	...	...	...	...	...	...	...	May to Sept., 1907.	Plate test. Film broken. Fouled.
40-A.F.	...	...	...	...	...	...	...	...	...	8.5	18.5	...	11.5	9.2	18.5	31.2	...	...	...	.6	...	...	...	...	...	...	2.3	...	...	No record.	Plate test. Good results.
41-A.C.	...	...	...	...	...	...	...	...	...	9.1	48.5	...	7.5	1.5	...	21.2	...	...	...	...	...	...	...	9.1	...	3.3	...	...	...	June 4, 1907, to Oct. 10, 1907.	Plate test. A few small blisters. No grass. No barnacles.
42-A.F.	...	...	...	...	...	...	...	2.7	...	8.2	22.0	...	6.8	7.0	22.0	19.2	...	...	...	...	...	...	...	8.2	...	8.2	...	...	...		
43-A.C.	1.4	...	...	...	...	...	...	...	...	11.4	1.1	...	2.1	5.0	34.2	33.2	...	...	...	...	...	...	...	...	...	5.7	...	5.7	...	June 8, 1907, to Oct. 10, 1907.	Plate test. A few small rust cones. No grass. Very few barnacles.
44-A.F.	1.2	...	...	...	...	...	...	3.7	...	10.0	.9	...	1.9	4.3	29.7	29.1	...	...	...	...	...	...	9.5	...	...	5.0	...	5.0	...		
45-A.C.	1.3	...	...	...	...	...	...	...	...	11.0	1.0	...	2.1	5.5	33.0	32.2	...	...	...	...	...	...	...	2.8	...	5.5	...	5.5	...	.....	Plate lost overboard.
46-A.F.	1.3	...	...	...	...	...	...	2.5	...	10.0	0.9	...	2.0	5.0	30.0	29.8	...	...	...	...	...	...	7.9	...	...	5.0	...	5.0	...		
47-A.C.	...	...	...	...	...	...	...	...	...	11.6	...	...	...	5.7	34.8	11.3	...	...	...	...	...	...	21.0	...	...	...	...	...	15.3	June 14, 1907, to Oct. 10, 1907.	Plate test. Few small blisters. No grass. Very few barnacles.
48-A.F.	...	...	...	...	...	...	...	4.1	...	8.3	...	...	...	7.5	24.8	14.0	...	...	...	...	...	...	15.0	...	...	4.1	...	...	22.5		
49-A.C.	...	...	...	...	...	...	...	...	...	8.7	23.2	...	6.2	5.7	...	38.9	...	...	11.5	...	...	...	...	...	...	...	...	5.7	...	June 26, 1907, to Oct. 10, 1907.	Plate test. Few small blisters. No grass or barnacles. Results very good.
50-A.F.	...	...	...	...	...	...	...	...	...	17.1	...	...	9.2	...	34.2	28.8	...	...	...	2.1	...	...	...	...	...	...	...	8.5	...		
51-A.F.	...	...	...	...	...	...	...	1.4	...	13.7	18.4	18.4	9.2	6.4	...	31.2	...	...	...	1.0	...	...	...	...	...	...	...	...	...	No record.	Tested on bottom coal barge. Film cracked, blistered and fouled.

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commandant of the Navy Yard at Norfolk and Captain Robert Stocker, C.C., U.S.N., the naval constructor.

By October 10, 1902, a plant had been established which could produce 208 gallons of ship's bottom paint per day. This amount was considered sufficient to paint all of the Navy vessels every six months, including those at that time being built.

When starting to develop formulæ for bottom paints very little technical information was available. Scientists and technologists had not published any data, so far as could be learned, and practically all data that had been compiled was held by persons engaged in the manufacture of bottom paints. Even at the present time there is very little published on the subject, scientific data which are available being confined largely to a classification of the various species of organisms which make up the fouling on ship's bottoms and to the life history, tendencies, reproduction, etc., of the various species. Dr. A. W. Bray, of the University of Iowa, has recently contributed valuable information on the relative effects of various toxic mediums on various species (his tests being laboratory tests) but it remains for some one to reproduce those mediums on the surface of submerged steel in such a way that the medium will be maintained for six months or longer.

European navies, with two or three exceptions, use commercial brands of paints and, so far as can be learned, in these exceptions varnish paints are used. Such data as I have been able to obtain from these sources are of little technical value as my tests along the lines suggested by the data give negative results in most cases.

Most of the data available from sources outside of the Navy consists largely of records of submersion tests comparing one commercial paint with another commercial paint, very little, if any, information being given about the formulæ. Such tests are usually so limited that the results can be accepted as only indicating and not proving.

With such scant information it was necessary, in starting tests to develop Navy formulæ, to try many combinations and through a process of substitutions, eliminations and alterations finally arrive at formulæ which would produce satisfactory paints.

The problem was to prevent rust and at the same time prevent fouling. Throughout the history of ship bottom paints the thought has been carried that two kinds of paint were necessary, one applied next to the steel to prevent rust, the other applied over the first paint to prevent fouling. (The writer is of the opinion that this is not necessary and that one paint should prevent both rust and fouling. This is shown to be possible by tests of a combination paint described later.)

To prevent rust it is necessary to have either an absolute waterproof film or a film containing that which will prevent rust even though the film is not waterproof. Films that are considered waterproof when applied to surfaces exposed only to air and the action of rain generally deteriorate rapidly under sea water. Granting, however, that an absolute waterproof film could be produced on a ship's bottom, the liability to damage of the film by anchor chains and floating objects is too great to warrant dependence upon waterproofness for preventing corrosion. It was therefore desirable to produce a film which contained that property for preventing corrosion even though water passed through it.

To prevent fouling the film must be toxic or repellent to all forms of fouling which infest the waters traversed by the vessel. Some of this fouling is of the animal kingdom, the most common forms being hydroids, worms and crustacea (barnacles). Some belong to the vegetable kingdom, the most common being algæ or grass.

The anti-fouling film must not contain an ingredient or ingredients which counteract with an ingredient or ingredients in the anti-corrosive film, or vice versa. The paint film must also stand alternate exposure to air and to submerged conditions and both paints must be of such a nature that they may be applied rapidly and will "dry" rapidly.

THE FIRST EXPERIMENTAL PAINTS PRODUCED BY THE UNITED STATES NAVY

These last named conditions are so desirable that in the beginning of the tests to develop suitable Navy formulæ attention was given solely to spirit varnish paints.

Twenty-one different combinations were used to produce anti-corrosive and anti-fouling paints, the tests of which began in June, 1906. Later thirty additional formulæ were tried. These formulæ are shown in Tables I and II, together with a brief summary of results. The tests were first made on steel plates submerged at the Navy Yard and on the bottoms of yard craft.

The various anti-corrosive paints were used with the various anti-fouling paints at the same time using commercial paints (such as had been extensively used by the Navy) as bases for comparisons. By October, 1907, the tests had progressed sufficiently to indicate clearly the merits of formula number 17 for anti-corrosive paint and formula number 19 for anti-fouling paint as exceeding those of any other formulæ and greatly exceeding the merits of the commercial paints used as bases for comparisons. Here it may be stated that this stage of the development was reached in considering only the first twenty-one formulæ shown in Table I.

The tests of the other thirty formulæ followed. These thirty formulæ are interesting in that some of them show quite a marked departure from a straight spirits varnish paint and contain hard gum varnishes, waxes and various toxines, used both singly or in combinations. While the record of these tests indicates merit in some cases it appears that the paints giving excellent results were not followed up and no departure from formulæ 17 and 19 resulted.

COMPARISON WITH COMMERCIAL PAINTS

During the next four years the experiments consisted of painting Navy vessels at various Navy Yards with paints made from formulæ 17 and 19 and with commercial paints to get comparisons on all types of vessels as to relative merit, costs of application, spreading rates, etc. These tests were usually made by quartering the bottoms, applying the commercial paints to diagonally opposite quarters and the Navy paints to the remaining quarters. Typical of these tests were those made on the U. S. S. *Kearsarge, Illinois, New Jersey, Virginia* and *Rhode Island,* the bottoms of which were examined at the Navy Yard, Puget Sound, Washington. The report made on July 8, 1908, was favorable to the Norfolk test paints (numbers 17 and 19). They prevented fouling better than a well-known commercial paint and gave results as to rust and fouling prevention equal to another well-known commercial paint, and were easier to apply. The Navy Yard, Boston, Mass., found that the Norfolk anti-corrosive paint had a slightly higher and the Norfolk anti-fouling an appreciably lower spreading rate than a commercial brand of bottom paints that had previously been used extensively. The Norfolk Yard found the following spreading rates using the same kinds of paints as were used by the Boston Yard:

Norfolk anti-corrosive paint 26 square yards per gallon.
Commercial anti-corrosive paint 26.3 square yards per gallon.
Norfolk anti-fouling paint 24 square yards per gallon.
Commercial anti-fouling paint 24.9 square yards per gallon.

The use of commercial paints on Navy vessels continued throughout this period of experiments. The approved list of brands of commercial paints in 1908 included the products of four manufacturers but in March, 1910, the Norfolk yard had on hand ten brands of anti-corrosive and seven brands of anti-fouling paints in addition to the experimental paints.

(To be continued)

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Automatic Water Level Adjusting Device for Boilers

IT has long been well known by operating engineers that if the water level in a boiler is maintained at its most economical fixed height a great saving in fuel results. Keeping the water level constant by hand regulation is practically impossible, so to obtain the desired result the White Fuel Oil Engineering Corporation, New York, has developed the Todd Thermofeed regulator which, it is claimed, will maintain the water level to within ⅛ inch (watertube boilers ¼ inch).

The device has but one mechanically actuated valve and depends for its operation on the water level fluctuations. The accompanying sectional views of the regulator and valve

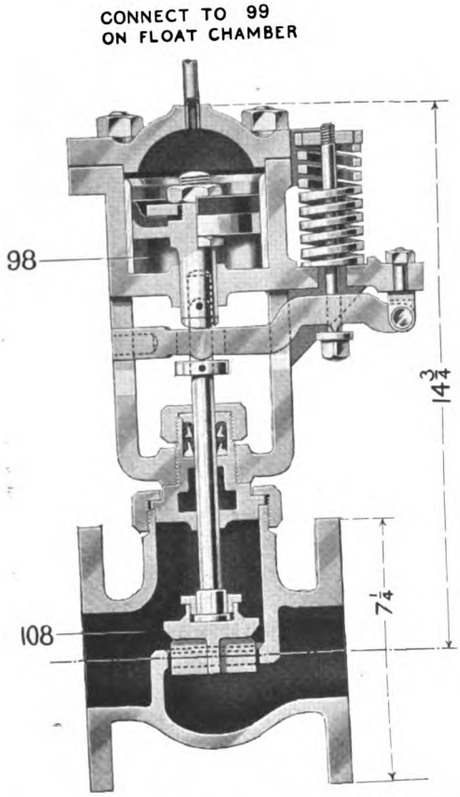

Fig. 1.—Sectional View of Todd Thermofeed Regulating Valve

illustrate the action of the valve between its two seats and the float action. The valve and seats constitute a single unit which is attached to the top part of a stem reaching from toggles in the float chamber to the top of a valve spindle.

The valve and seats together can be removed for examination, cleaning or renewal. The float, which is the only other moving mechanism in the regulator, consists of an electrolytically and hermetically sealed spun copper ball. The float is connected to the regulator feed valve through a ¼-inch pipe. By shutting off the steam and water valves it is possible to take the whole of the Thermofeed mechanism apart.

Practically the entire function of the regulator is controlled through the three-way valve, marked 43, in Fig. 2. This is a double valve which, when it is on the outer seat in the pipe, allows the cylinder marked 98 in Fig. 1 to be put in communication with the control valve 46 in Fig. 2. When the valve is on the inner seat the cylinder is opened to the atmosphere which puts the Thermofeed out of action. The double seated controlling valve 46 performs the main function of the apparatus and is attached by a rod, 60, to the float through toggle levers so disposed as to reverse the direction of motion. Any movement of the float is diminished in the ratio of 10 to 1 as transmitted through the toggles and the rod 60 to the valve 46. If the water level and the float fall, valve 46 is raised upwards to the lower seat, closing any exit of steam through this valve and simultaneously putting the cylinder 98 in direct communication to the atmosphere by way of ports in 44 and exhaust pipe 90.

If the water level and the float rise, valve 46 is pulled downwards on its upper seat thereby permitting the passage of steam through the lower valve on to the piston in the cylinder 98, in this way gradually depressing the main regulating valve 108 on to its seat.

The entire controlling mechanism in the float chamber is

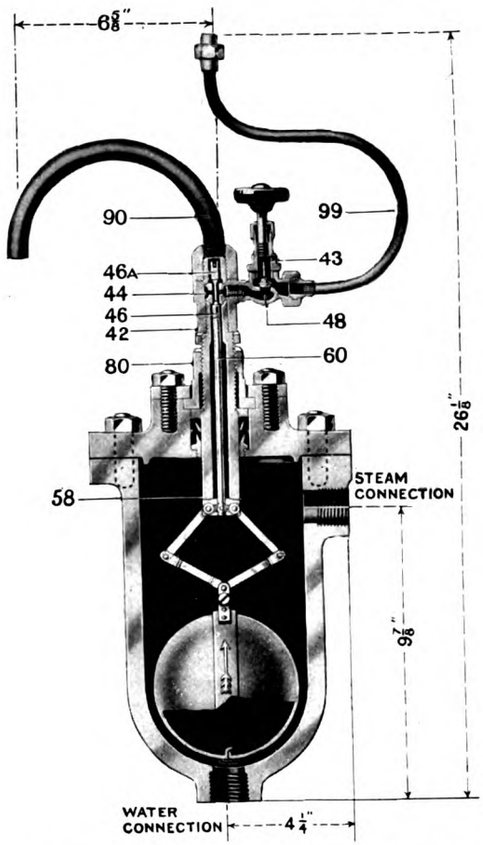

Fig. 2.—Sectional View of the Todd Thermofeed Regulator

attached to sleeve 58 and can be raised or lowered by the adjusting nut, 80, even when the device is in action. This provides a fine adjustment of the desired permanent water level.

International Chamber of Commerce to Convene in Rome

SEVERAL hundred representative American business men will attend the second general meeting of the International Chamber of Commerce to be held in Rome during the week of March 19, 1923, according to an announcement made recently by the American Section of the Chamber. The meeting will bring together leading business men from all over the world for a discussion of world trade problems. Sixteen countries affiliated with the International Chamber will send delegates, while several other countries which have made application for admission to membership in the Chamber will be represented.

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Insulating Materials for Shipbuilding Purposes

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

INSULATING materials of interest in the shipbuilding field are those which insulate against heat, electricity and sound. The first mentioned has two main purposes—to keep useful heat where it will be of greatest value and to keep useful or useless heat from where it would be a detriment. The latter, when not in connection with refrigerating equipment, will be called for convenience of reference Miscellaneous Heat Resisting Insulation. Materials which on account of the high temperatures dealt with are selected more for their refractory properties than for their insulating properties will be classified as Refractory Materials. Electrical insulation is a specialty that is not usually dealt with independently by the shipbuilder and will be only briefly considered.

The principal manufacturers of all of the more important insulating materials have prepared detailed specifications covering their particular fields of usefulness and the best methods of applying them and these specifications will be found to be of great value when dealing with these materials. The manufacturers also give heat transmission and weight data.

Figures of the heat transmission or the heat conductivity of insulating materials, given by manufacturers or others, should be examined to determine which of the two is referred to and how the figures were obtained, because in some cases they are very misleading. Insulating materials offer resistance to the passage of heat through them from one surface to the other and there is a further resistance to the passage of the heat from the surface of the material to the air. The latter is practically uniform with different materials and for a single surface has been found by the Bureau of Standards to amount to 2/10 inch of corkboard or other good insulating material, as a maximum, for interior conditions with quiet air. It is negligible between surfaces of different materials built up in layers. Heat conductivity figures show by inversion the resistance of the material itself and heat transmission figures show both the resistance of the material and the surface resistance.

In the usual shipboard installations the insulating material neither stands alone by itself nor is there a wide air space on each side of it. With flat surfaces there are always external layers of wood or other materials and with pipe coverings there is the pipe on one side and a jacket or other coating on the other. So it is manifest that a comparison of the materials should be upon the basis of their actual internal thermal conductivity and not on the basis of transmission from air on one side to air on the other.

In some cases heat transmission figures are determined by accurate test for a 1-inch thickness of a material and then divided by two to obtain the value of the 2-inch material and so on. The results are necessarily erroneous and unduly favorable to the thicker material.

Tests of insulating materials made by the Bureau of Standards are on the basis of actual internal conductivity. The conductivities of a number of materials tested by them, together with their weights, will be found later on in the article in Table I. Some of these materials are not strictly insulating materials. Tables II and III give transmission or conductivity figures obtained from several sources for the materials principally dealt with in this article and they have some value, if used with discretion and checked up with Table I. The conductivities of some materials increase slowly with increasing temperature while others decrease slowly.

Generally speaking, the less dense a material is the more opposition it offers to the passage of heat. Air would be the best non-conductor of heat, aside from a vacuum, if it were not for the heat conveyed through it by radiation and convection, the former with small temperature differences being by far the principal reason why air spaces are not good insulators. A vacuum bounded by ordinary building materials has been found by the Bureau of Standards to have an insulating value less than ½ inch of corkboard. With air present this will be still lower and for widths greater than one inch will be practically independent of the width of the space, as the radiation factor, which constitutes the greater part of the heat transfer, is independent of the width. The radiation can be cut down to a large extent by running an insulating material through the air space. Convection can be prevented only by dividing the air up into small non-contiguous spaces. Insulating materials derive their efficiency chiefly from the multitude of small entrapped air spaces they contain; the smaller these are, the better.

The principal factors governing the selection of any insulating materials are:

Insulating efficiency.
Durability.
Ease of application.
Non-combustible properties.
Weight.
Cost.

Waterproof qualities are desirable as water adversely affects the efficiency and in most cases the durability.

For insulation of accommodations vermin proof properties are highly desirable.

For high temperature work the material should stand up without fusing or excessive shrinkage.

Refrigerating insulation materials must be odorless and of a nature not to develop odors from decay, mold or other causes.

Structural strength and appearance are factors in some cases.

There are many materials which might be used for insulating purposes on shipboard that are not here dealt with. Some of them will be found listed in Table I. The article, however, deals with the more important of the materials and those in most general use.

Insulation on boilers, pipe fittings and other work which requires to be tested should not be put on until these tests have been made and the work approved by the inspectors concerned.

Refractory Materials

The most used refractory materials are fire brick and fire clay, the latter being required for filling up the joints in the former. Fire brick tile and other materials of the requisite heat resisting properties are on the market and are used to some extent.

Refractory materials are required for lining the steel cas-

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

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ings of watertube boilers and similar service. They assist in keeping the furnace at a high temperature and in diffusing the heat.

Fire Brick

In preparing requisitions for fire brick it is usually necessary only to list the sizes required and to specify—

1. That they shall be high grade commercial quality, suitable for coal or oil burning furnaces. Fire brick in an oil burning furnace should be able to stand a heat of 3,200 degrees F. without fusing or cracking.
2. That they shall have a medium, uniform grain and all surfaces shall be reasonably true and free from warpage.
3. That on dimensions of 4 inches or over, they shall not vary more than ¼ inch per linear foot from the specified dimensions. On dimensions under 4 inches they shall not vary more than ⅜ inch per linear foot from the specified dimensions.

The last two items are requirements of the Navy Department, which also requires the trade name or the name of the manufacturer to be molded in each brick and calls for a minimum softening temperature of 3,100 degrees F. and the following chemical properties:

	Percent
Silicon dioxide (approximately)	54
Aluminum oxide (approximately)	41
Basic fluxes as K, Na, Mg, Ca, Fe. determined as oxides (approximately)	5

If the heat and spall resisting properties of the make of fire brick dealt with are not known, and known to be uniform, it is well to request a statement of the guaranteed minimum softening temperature and a chemical analysis of the bricks proposed, showing the percentage of silicon dioxide, aluminum oxide and the basic fluxes, iron, calcium, magnesium, potassium and sodium oxides.

The American Society for Testing Materials has adopted a Standard Specification, C27-20, for determining the properties of fire brick. This specification deals with fire clay bricks with silica content less than 70 percent and silicious clay fire bricks whose silica content is 70 percent or over. The former are required to have a softening point not less than that of a standard cone which softens at about 3,065 degrees F. as determined in a specified manner; and when heated in a suitable furnace to a temperature of 2,552 degrees F. maintained at this temperature for 5 hours, and cooled, they are required to show a contraction of not over 1½ percent of the original length nor an expansion of more than 1 percent. For the silicious clay bricks the softening point is to be not less than that of a standard cone which softens at about 2,975 degrees F., the contraction and expansion being as above; and they must also be subjected to a load test when heated, in accordance with a Standard Test for Refractory Materials, C16-20, with a pressure on the ends of 25 pounds per square inch and a maximum furnace temperature of 2,462 degrees F., after which the brick is to show a contraction of not over 4 percent of the original length and an expansion of not over 1 percent. Bricks with less than 70 percent silica content which soften at a temperature less than that specified above but more than the softening point of a standard cone which softens at about 3,002 degrees F., may still be accepted, if they are put through and pass the tests required, as outlined above, for the bricks with 70 percent silica or over.

Fire Clay

Fire clay should be specified to be high grade and to be dry and ground to such fineness that it will all pass through a No. 20 sieve. Information about sieves will be found in the article on Cement and Concrete for Shipbuilding Purposes.* The Navy Department calls for the same chemical properties as for fire brick and a minimum softening temperature of 3,000 degrees F.

*See Marine Engineering and Shipping Age, May, 1922, page 331.

High Temperature Cements

These take the place of fire clay in bonding fire bricks and such cements should be used rather than fire clay in oil burning furnaces. They can be obtained in various grades to suit different temperature ranges, such as 1,800 to 2,500 degrees, 2,500 to 3,000 degrees, 3,000 to 3,200 degrees, and 3,200 degrees and over. They require a certain temperature to properly flux them and the manufacturer should be informed regarding any set of conditions. The cement should protrude from the joint and be rounded over to protect the corners of the fire bricks.

A suitable high temperature cement thinned down with water so as to form a mixture that can be applied with a brush forms a valuable wash for grouting over the inner surface of furnace linings. Flux mixtures containing silicate of soda, salt, broken glass, etc., should not be used to produce a glaze. Silicate of soda affects the bricks chemically and eventually destroys the lining.

High temperature cement can be mixed up with crushed fire brick to make lining for furnace doors, patches, etc.

Heat Retaining Insulation

Diatomaceous Earth (Kieselguhr)

This is practically pure silica in cellular form, made up of minute shells or skeletons of marine plants known as diatoms which existed ages ago in the waters that then covered the earth. The shells are hollow and contain air broken up into such minute particles that no circulation, with its attendant convection of heat, can take place.

Insulating bricks of which diatomaceous earth is the principal ingredient have about ten times the heat insulating value of fire brick. They are of great value for backing up fire brick in boiler furnaces and similar service. They have too little abrasion resistance for anything but backing. Several proprietary products of this kind are on the market, such as Sil-o-cel bricks and Nonpareil insulating bricks. These bricks are very light weight. The standard size Sil-o-cel brick, 9 inches by 4½ inches by 2½ inches, weighs 1¾ pounds. The standard size Nonpareil brick, 9 inches by 4½ inches by 2½ inches, weighs 1½ pounds. In making the latter bricks the diatomaceous earth is pulverized and mixed with finely ground cork, which is subsequently burned out.

Diatomaceous Earth and Asbestos

Diatomaceous earth mixed with asbestos and compressed forms a suitable covering or lagging for boilers, steam pipes, feed water heaters, evaporators, etc. Thicknesses used are the same as for 85 percent magnesia.

The standard sectional pipe covering is obtainable. Valves and fittings are covered with plastic cement of the same material and thickness.

It is desirable to specify that the insulating qualities shall be equal to those of the best quality 85 percent magnesia covering.

Eighty-five Percent Magnesia

This is the standard covering for the steam and water containing surfaces of boilers and for uptakes, feed water heaters, evaporators, pressure steam pipes and similar services and also for lagging turbines and the cylinders of main engines. It is of course of value for less severe service but in some cases cheaper coverings will answer the purpose. It is very efficient for a high heat material, durable, easily handled and of light weight. Wetting does not damage it and on being dried its insulating value is restored. It is a mixture of hydrated carbonate of magnesia and asbestos fiber, containing at least 85 percent of the former and at least 95 percent of both combined. Specifications for coverings of this material, prepared by the Magnesia Association of America, specify the following thicknesses as representing

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good practice for conditions which approximate those on shipboard; and they give charts and tables for determining scientifically correct thicknesses for variations in the determining factors—fuel cost, steam pressure and superheat:

Boilers and uptakes	3 inches total
Donkey boilers	2 inches total
Pipes—superheated steam—½ inch to 1½ inches, inclusive	1¾ inches
2 inches to 3½ inches, inclusive	2⅛ inches
4 inches and larger	3 inches (double layer), and ½-inch "85% magnesia" plastic cement.
Pipes—high pressure saturated steam, up to 4 inches	2 inches
4 inches to 6 inches, inclusive	2¼ inches
7 inches to 10 inches, inclusive	2½ inches
Pipes—low pressure steam, exhaust steam, heating system, feed water:	
½ inch to 1½ inches, inclusive	⅞ inch
2 inches to 3½ inches, inclusive	1 1/32 inches
4 inches to 6 inches, inclusive	1⅛ inches
7 inches to 10 inches, inclusive	1¼ inches
12 inches and larger	1½ inches
Flanges—superheated steam and high pressure saturated steam	2 inches
low pressure steam, exhaust steam and heating system	1 inch
Heaters, receivers, separators, tanks, etc—high pressure steam	3 inches total
low pressure steam	2 inches total
hot water	1½ inches total
Traps—high pressure	1¼ inches total
low pressure	1 inch total

For piping the usual sectional covering in two halves is used, either in a single or double layer, 36-inch sections. When two layers are used they should be applied with the butt and lateral joints broken. The sections are furnished with a so-called canvas jacket pasted on and supplied with bands or wires for fastening; but it is generally desirable to apply rosin sized sheathing paper over the jacket followed by an additional jacket, well sewed on, of 8-ounce canvas as described in the article on Canvas, Bunting and Felt for Shipbuilding Purposes*, the canvas being subsequently painted. Such a waterproof covering is essential on piping to deck machinery and other exposed piping.

Block material on boilers, evaporators, etc., is securely wired in place, covered with galvanized iron wire mesh and then with ¼ to ½ inch of hard finishing asbestos cement troweled to a hard, smooth finish, or with galvanized steel plates. Block material on engine cylinders and similar service is usually held in place and covered by planished iron plates.

For boilers and steam drums No. 14 gage annealed iron wire and 2-inch mesh poultry wire are advisable, while for evaporators and similar service the wire can be No. 18 gage with 1½-inch mesh poultry wire.

The 85 percent magnesia cement covering may also be applied as a cement. This is sometimes desirable on irregular surfaces, but the blocks or sectional coverings are generally preferable.

Asbestos Felt

Asbestos is a mineral fiber and asbestos felt is the pure fiber felted or built up in layers. It is often called fire felt. It can be obtained in rolls from 3/32 to ⅜ inch thick and in sheets from ⅛ inch to 1 inch thick.

It is not as efficient as the 85 percent magnesia covering but is more resistant to vibration. It is decay proof and highly fire resistant. It is frequently used for lining fire doors of boilers and similar service; also for lagging the cylinders of small steam engines, the steam ends of pumps, etc. The flexible sheets are used for a great variety of purposes where there is need for a material that may be folded, bent or wrapped around pipes and heated surfaces.

Sponge Felted Asbestos

This is composed of thin layers of asbestos felt in which are embedded particles of finely ground spongy material, built up in blocks in thicknesses from ½ inch to 4 inches and in sectional pipe covering in thicknesses from ½ inch to 3 inches. Valves and fittings are covered with asbestos cement of the same thickness.

Sponge felted asbestos has the high insulating properties of the 85 percent magnesia covering combined with the resistance to vibration of asbestos felt.

It is desirable to specify that the insulating qualities shall be equal to those of the best quality 85 percent magnesia covering.

Asbestos Paper Products

Asbestos paper is a pulped material made almost entirely of asbestos fiber but having more filler than asbestos felt. It can be obtained in thicknesses from about 1/100 inch to ⅛ inch. The 3/32 and ⅛ inch thicknesses are spoken of as rollboard.

The principal field for asbestos paper as a heat retaining insulation is when it is made up into blocks and pipe covering in various ways. Generally flat sheets and indented or corrugated sheets are cemented together alternately. One make has the sheets separated by narrow strips of the same material. Some of these coverings approach closely in insulating value the 85 percent magnesia covering. A covering of this nature is tougher than the magnesia covering. As the insulating value is largely the result of the air cells formed by the indentations, corrugations, etc., the cheaper grades of this covering are often called air cell covering. In order to avoid the losses due to the heated air traveling along the corrugations, one manufacturer for some years marketed a covering with the corrugations running around the pipe. He found, however, that the trade would not pay the extra cost of the more efficient covering and has brought out a substitute covering with the longitudinal corrugations interrupted at intervals. This can be produced at practically the same cost as with the corrugations forming open channels from end to end. As may be seen from Table II, the air cell covering loses efficiency more rapidly at the high temperature ranges than the other coverings.

In some cases the asbestos paper coverings are more desirable than the 85 percent magnesia covering. An asbestos covering is more durable on vibrating pipes; and the relatively high cost of the latter covering is often not warranted on exhaust steam pipes, heating system pipes, feed water pipes and warm air ducts, where comparatively small temperature differences are met with. The better grades are considerably heavier than the 85 percent magnesia covering but the air cell coverings are of less weight.

Asbestos Blocks

The asbestos fiber matted into blocks and bound together with a fireproof adhesive, or layers of asbestos felt cemented together, forms a covering with good insulating efficiency and great resistance to high temperatures. It may be considered next to 85 percent magnesia for use on uptakes.

Asbestos blocks are suitable for lagging engine cylinders and similar service and in such service are protected by planished iron or other metal covering.

Some high temperature block coverings for special service have refractory materials mixed with the asbestos.

Asbestos Millboard

This is composed of asbestos fiber with a very small percentage of binding or sizing material and can be obtained in sheets from 1/16 to ½ inch thick. There are three standard grades—a hard compact board due to closely matted fiber, a board of medium consistency and a soft board due to loosely matted fiber. The two former are most met with on shipboard.

The Navy Department has prepared detail specifications for this material. Its requirements that are the most valuable for general application are:

1. Boards of uniform thickness, composed of asbestos fiber with a small amount of binding material.
2. Vegetable matter shall not exceed 3 percent by weight of the composition of the millboard and the same shall only be used as sizing.

*See MARINE ENGINEERING AND SHIPPING AGE, February, 1922, page 131.

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3. Millboard shall show no change of texture and no softening when heated indefinitely in a dry heat at 400 degrees F.
4. The loss of weight of millboard after it has been dried to a constant weight at a temperature not exceeding 220 degrees F., shall not exceed 20 percent when a 2-gram sample is cut up and heated to a bright cherry red heat, in an open crucible in a gas muffle for 30 minutes.
5. The maximum acceptable weights for millboard reduced to the basis of 1 square foot area, 1 inch thick, shall be:

Medium millboard ..... 6.00 pounds.
Hard millboard ..... 6.50 pounds.

Asbestos millboard ¼ inch to ⅜ inch thick is sometimes used back of fire brick in boiler furnaces. It is of value for lining casing doors and headers and similar service.

Hair Felt

Hair felt insulation is principally used for refrigerating and sound proofing purposes and the nature of the material will be found described under the former heading. It has good insulating value but will not stand high temperatures. It is often used for covering hot water piping.

Wool Felt

Wool felt, which is simply felted sheep's wool, has good insulating value at moderate temperatures. It will not stand high temperatures and after being exposed to dampness it loses its efficiency and eventually decays. With the outside waterproofed and all joints sealed so that water cannot gather in it, such a covering is of value for hot water pipes and similar moderate temperature service.

Wool felt covering for hot water lines has an inner core of asbestos paper.

Mineral Wool

Mineral wool insulation is used principally for refrigeration purposes and the material will be dealt with more fully under that head. It may, however, be well to note that it has been made up into thick sheets and blocks with about one-third of one percent of binder, for use as heat retaining insulation. Such a product is suitable for low pressure work on boilers and piping.

Vegetable Fiber Products

There are many proprietary insulating products of this nature and some of them have been found to fulfill shipboard requirements as heat retaining insulation for spaces where the useful heat has to be conserved, such as in the accommodations of vessels not propelled by steam. Any of them which may be presented for consideration can be readily examined for everything except durability and the character of the ingredients is a good guide to that.

One of these products is a quilt insulation called Linofelt that is made of flax fibers which have been degummed and retted and formed into a batlike cotton batting, and quilted between two sheets of waterproof paper. It can be obtained in ¼ inch, ½ inch, ¾ inch and 1 inch thicknesses. The 1 inch thickness weighs 0.66 pound per square foot. The thinner products are somewhat heavier in proportion. It is claimed to be mouse and vermin proof.

Another product is Fibrofelt, a semi-rigid material made from hemp fiber and containing a large number of air cells. It can be furnished in large sheets ¼ inch, ½ inch, ¾ inch and 1 inch thick. The 1 inch thickness weighs 1¼ pounds per square foot. In addition to the ordinary grade there is also a waterproof Fibrofelt and a fireproof Fibrofelt. It is claimed to be mouse and vermin proof.

Another product, Flaxlinum, much resembles Fibrofelt but is made from flax fiber which has been rendered rat and vermin proof. It comes in sheets ½ inch and 1 inch thick.

Cabot's Quilt is another product suitable for joinerwork heat retaining insulation. It is a felted matting of cured eel-grass stitched between two layers of tough Kraft paper, waterproof paper, or asbestos paper, as desired. It is light in weight, repels mice and vermin and is claimed to be decay proof and uninjured by moisture. The Kraft paper grade is made single-ply about ⅓ inch thick, double-ply about ½ inch thick and triple-ply about ¾ inch thick. The other two grades are of the double-ply thickness.

There are various products made up like wood boards, of materials which have some insulating value, but their properties do not particularly recommend them for this service.

Insulating Paper

Insulating paper might be classed with the other vegetable fiber products but its wide range of service both independently and combined with other insulating materials entitles it to special classification. The best insulating paper is a waterproof paper containing jute, flax and rope stock, saturated and coated with asphalt, which weighs 80 pounds or more per 1,000 square feet, and this weight should be specified as a minimum. It comes in rolls of various widths, the usual width for insulating work being 36 inches.

Refrigerating Insulation

It is especially important with refrigerating insulation that it be efficient and durable in case of becoming wet. It should be sanitary and odorless. Non-combustible properties are not as important as for heat retaining insulation.

A good efficiency requirement for a completed refrigerated compartment installation is that after operating the refrigerating plant for a reasonable time it is to be shut down and the temperature is not to subsequently rise over 1 degree per hour, based on an outside temperature of 90 degrees.

Cork is the principal material for use as refrigerating insulation on shipboard including pipe covering. Balsa wood has been used to some extent for this service. For curved surfaces and surfaces broken up by framing, such as the sides of a vessel, the hold bulkheads and the underside of steel deck over refrigerated holds, mineral wool is considerably used.

Sheet or formed material should be used where conditions permit. It is impossible to make loose insulating materials moisture proof; they are bound to settle leaving unprotected spaces and, if a break occurs in the retaining sheathing, they will run out, with the same result.

All insulation in refrigerated rooms requires an inner sheathing of some kind and where this is wood the wood is preferably spruce on account of its freedom from odor and consequent tainting of the foodstuffs. For the same reason asphalt that is entirely free from odor, and not tar or pitch, should be employed when erecting the insulation of such spaces.

Where a ship is classed, the insulation of refrigerated spaces has to be passed upon by and be acceptable to the classification society concerned.

Corkboard

This is the standard refrigerating insulation for use in partitions, on decks and other flat or nearly flat surfaces. It is also used on curved surfaces in conjunction with a packing of granulated cork or other material. Dried cork in its natural state contains 47 percent of woody fiber and 53 percent of entrapped air.

The most efficient grade of corkboard consists of pure granulated cork compressed in metal molds and baked at a moderate temperature. The baking process brings out the natural gum or rosin in the cork, binding the whole mass firmly together, and no artificial binder is necessary. It can be obtained in sheets ¼, 5/16, ⅜, ½, ⅝, ¾, ⅞, 1, 1½, 2, 3, 4 and 6 inches thick; the standard size of sheet is 12 by 36 inches. It comes with an odorless asphalt mastic finish about ⅛ inch thick ironed on the surface at the factory. An average weight is about ⅞ pound per square foot for the 1 inch thickness and 1⅝ pounds for the 2 inch thickness.

One maker of corkboard produces and claims superiority

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for a product which contains 4.8 percent by volume and 16⅔ percent by weight of an odorless asphalt binder. The granulated cork is thoroughly dried and then coated with the asphalt at a high temperature. It is then molded into boards under no greater pressure than that necessary to make a close union of the particles. The boards measure 16⅝ inches by 34⅝ inches, or 4 square feet. This material weighs about 1½ pounds per square foot per inch of thickness. Superiority is claimed for this product on the ground that it has a greater weight of cork than other corkboard, that compressing the cork reduces its valuable air content and that burning the cork to break down the elasticity of the cells and make the compression permanent increases its susceptibility to moisture and adversely affects its durability. The greater weight of the product is, however, a detriment for shipboard service. The efficiency has been proved to be less than that of the pure corkboard and the latter stands up satisfactorily against moisture.

Other makes of corkboard with an asphalt binder are obtainable. Cheaper grades of corkboard made of granulated cork mixed with pitch, and probably also containing a certain amount of cork dust and dirt, are also on the market; but they are not desirable for shipboard installations. The pitch is particularly objectionable, as before mentioned.

The Navy Department specifications for corkboard require it to be pure, ground, compressed cork, held together by the natural cork gum as a binder; and they require further—

The cork shall be furnished in sheets 36 inches by 12 inches, in thicknesses of 1 inch, 1½ inches, 2 inches, or 3 inches, as specified. The weight per cubic foot shall be not less than 8 pounds nor more than 12 pounds.

Representative samples of the cork shall be submerged in boiling water at atmospheric pressure for three hours without disintegrating. Immediately upon removal from the boiling water, samples shall be measured for linear expansion, which shall not exceed 2 percent in any direction.

One of the manufacturers of this material recommends for average climatic and building construction conditions on land the following:

Temperature	Thickness
—20 to —5 degrees F.	8 inches.
— 5 to 5 degrees F.	6 inches.
5 to 20 degrees F.	5 inches.
20 to 35 degrees F.	4 inches.
35 to 45 degrees F.	3 inches.
45 degrees and above	2 inches.

This agrees pretty well with the usual shipboard practice.

CORK PIPE COVERING

This is one of the most widely used cold pipe coverings. The most efficient quality is made by compressing and then baking pure granulated cork in molds of the proper size and shape to suit the pipes and fittings which are to be covered. The baking brings out the natural gum of the cork which binds the mass firmly together as before stated. As the compressed cork comes from the molds it is coated inside and out with a waterproof mineral rubber finish, ironed on hot. Cork pipe coverings can also be obtained made up with binding material as explained under the head of "corkboard"; and the surfaces are given a waterproof coating.

This covering can be obtained in sectional form to fit any standard pipe from ¼ inch to 8 inches, sections 36 inches long. Special shaped filling pieces are obtainable for use between pipes that are too close together, or back of pipes that are too close to other surfaces, for the standard covering. For pipes larger than 8 inches cork lagging is used. The thicknesses usually required are—

1. Standard brine covering, about 2½ inches thick, for brine and ammonia gas lines, and generally where the refrigerant ranges from 0 to 25 degrees F.
2. Special thick brine covering, about 3½ inches thick, for brine lines, where the temperature of the refrigerant runs below 0 degrees F.
3. Ice water covering, about 1½ inches thick, for use on refrigerated drinking water and liquid ammonia lines, and generally where temperatures of 25 to 45 degrees F. are carried.
4. Cold water covering, for pipes up to and including four inches, about 1 inch thick, for use on cold water piping to prevent sweating. For sizes larger than four inches, use ice water covering.

When calling for this pipe covering as a part of refrigerating apparatus specifications it is usually sufficient to stipulate that the refrigerating supply and return pipes will be lagged with best quality compressed cork of suitable thickness.

The complete covering requires—

1. A putty for filling any spaces that may exist between the covering and the pipes or fittings.
2. A waterproof cement for cementing the joints.
3. A seam filler for smoothing up seams and chipped edges.
4. Copper clad steel wire for holding the covering in place. Copper wire and galvanized wire have not been found satisfactory.
5. Asphaltic paint for coating the outside of the covering to give it a neat and trim appearance.

These materials are obtainable from the manufacturer of the covering.

CORK LAGGING

This is of the same character as cork pipe covering, but is denser and more suitable for the insulation of coolers, tanks, filters, etc., than the regular corkboard. The pieces are beveled to the proper radius and have a mineral rubber finish on both the inner and outer surfaces, ironed on at the factory.

In order to guard against the use of the regular corkboard it is well to specify that the material be pure compressed cork and weigh not less than 1¼ pounds per board foot.

Cork lagging calls for the use of the same putty, cement, etc., as listed under the head of cork piping covering except that on brine coolers, tanks, etc., the lagging is usually held in place by iron bands about 1 inch wide, and No. 20 gage, which are drawn up tight by bolts through clips riveted to the ends of the bands.

Usual thicknesses are as follows:

Temperature	Thickness
Below 5 degrees F.	6 inches.
5 to 20 degrees F.	5 inches.
20 to 32 degrees F.	4 inches.
32 to 55 degrees F.	3 inches.
55 to 65 degrees F.	2 inches.
Above 65 degrees F.	1½ inches.

GRANULATED CORK

Granulated cork comes in several degrees of fineness. The standard grade for insulating purposes will all pass through a ½ inch mesh screen and weighs about 6½ pounds per cubic foot.

Granulated cork is of value for packing in back of corkboard or cork lagging on curved and irregular surfaces. It is used considerably for this purpose in the holds of refrigerated ships as well as when insulating brine coolers, dished heads of tanks, etc. It does not become waterlogged like most forms of loose insulating materials, but possesses their disadvantages in other respects.

BALSA WOOD

The nature of this wood has been dealt with in the article on "Timbers and Lumber for Shipbuilding Purposes"* and its value as an insulating material has been there referred to. Its use for such purposes meets with classification society approval. It is a substitute for corkboard in the services mentioned for that material. It is also used in the construction of portable refrigerators. It is too soft to serve as a surface material but has sufficient strength to carry a limited load.

Balsa wood has to be protected from destruction by mois-

*See MARINE ENGINEERING AND SHIPPING AGE, October, 1921, page 771.

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ture. This is accomplished by first steaming the planks in kilns and subjecting them to a subsequent process of slow evaporation until the moisture content is below 10 percent. In this condition the wood is transferred to cylinders where under the required temperature and pressure conditions it is encysted by a proprietary process. This process carries a waterproofing compound through the wood to varying depths, according to the extent of the treatment, coating the ducts and cell walls and preventing thereby access of moisture to the wood structure and destroying the capillarity of the ducts. The owners of this process recommend that the surface be given an additional bitumen waterproof coating when the wood is to be used for refrigerating insulation.

The above mentioned encysting process somewhat reduces the insulating value of the wood and adds to its weight. The following data regarding this were obtained by the Bureau of Standards as the result of a series of tests with a temperature difference of about 35 degrees F. at a mean temperature of about 85 degrees F. The first column shows the conductivity in British thermal units per 24 hours, per square foot of surface, per degree difference in temperature, per inch of thickness. The weight is in pounds per cubic foot.

	Conductivity	Weight
Light wood, untreated	8.3	7.4
Light wood, light treatment	7.8	8.8
Light wood, light treatment, shellaced	8.3	8.4
Light wood, bitumen coated	7.9	9.6
Light wood, medium treatment	8.6	11.8
Medium wood, untreated	9.2	8.9
Medium wood, light treatment	9.2	9.6
Medium wood, medium treatment	10.7	14.7
Medium wood, heavy treatment	12.9	16.8
Medium wood, very heavy treatment	21.6	41.6
Medium heavy wood, untreated	14.0	20.5
Medium heavy wood, light treatment	13.8	20.8

Although a considerable number of shipboard installations of Balsa wood as a refrigerating insulation have been made in recent years, the writer does not feel that they are sufficient in number or age to fully determine the durability of this material, even with thorough encysting.

As stated in the earlier paper, the cost of Balsa wood insulation may in some cases be expected to compare favorably with corkboard insulation; the weight is as above given and the combustible properties of the encysted wood are not much worse than the usual run of refrigerating insulating materials, with the exception of mineral wool.

(To be continued)

Self-Operating Water Circulator for Scotch Boilers

A NEW type of water circulator, known as the "Compulsoree," designed to pick up cold water from the bottom of the boiler and discharge it just above the working water level thus creating a positive circulation has been developed by N. E. McClelland and Company, Ltd., 2-4 Stone street, New York.

The circulator consists of a steel cylinder to which are affixed by electrical welding two cast steel heads, one at each end, the heads being constructed with lugs by means of which the instrument is secured in the boiler, and having openings to accommodate leads of piping. The assembled instrument is located in the Scotch type of boiler as shown in the diagram.

The "Compulsoree" operates on the principle of an air or steam lock, air being the actuating gas until as the water in the boiler gets hotter air is replaced by vapor.

During the process of filling the boiler, water rises in the suction leg of the instrument until a level is reached where the bend at the top of this leg is entirely submerged. At this moment, the water in the suction leg overflows into the enlarged chamber of the "Compulsoree" and falls by gravity to the bottom of the chamber. As the water drops into the chamber, it displaces an equivalent amount of air, but owing to the increased size of the chamber over the suction pipe it is impossible for a sufficient amount of water to fall into the chamber necessary to force out all the air. Therefore, a moment is very quickly reached where atmospheric pressure in the discharge leg, the end of which is at all times above water, plus the weight of water which has fallen into the chamber, will compress the air remaining in the chamber sufficient to prevent a further rise in the suction leg above

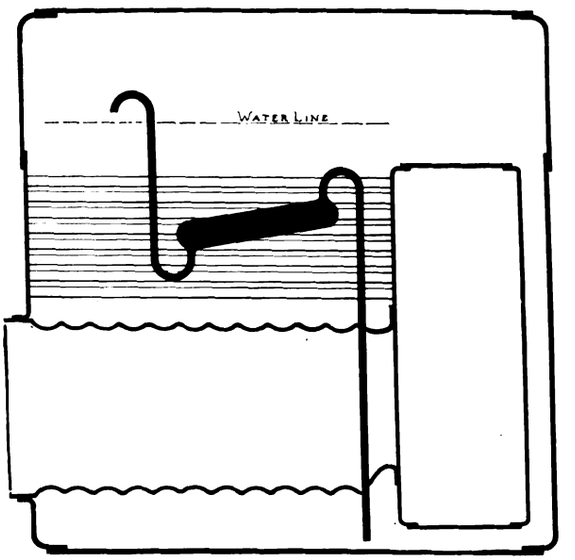

Diagram Showing Arrangement of "Compulsoree" Circulator Installed in Scotch Boiler

the level where it is held in check by the pressure as described.

An air lock is now formed between the column of water in the suction leg and the water which has accumulated in the chamber of the instrument.

When the process of filling the boiler to the required level is complete and the fires lighted, hot gases passing through the fire tubes impart heat to the "Compulsoree" chamber thereby causing the air imprisoned in the chamber to expand and force the water lying therein out through the discharge end along the line of least resistance. The chamber of the "Compulsoree" being now empty, water again rises in the suction leg and overflows into the chamber causing the whole process described above to be repeated. Following the first discharge of water the cycle of operation becomes continuous, cold water being picked up from the bottom of the boiler and discharged into the warmer water on top at the rate, it is claimed, of one gallon every four seconds.

The circulation created by the "Compulsoree" within the boiler is entirely independent of any outside influence as there are no connections on the outside of the boiler whatever. The instrument is constructed of high quality material with no valves or working parts to get out of order. It has been adopted by many of the leading steamship owners and railroad companies throughout the world.

Trial of Diesel Engined Yacht Cynthia

ON July 20 the yacht *Cynthia*, which was designed by Cox and Stevens, naval architects, New York, and built by the Tebo Yacht Basin Company of the Todd Shipyards Corporation, New York, was given an official trial. The *Cynthia* is 129 feet overall, 122 feet 3 inches on the load waterline, 23 feet beam and 6 feet 6 inches draft.

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She is a twin screw vessel engined with two Winton 250 horsepower 4 cycle, 6 cylinder full Diesels which propel her at a speed of 12 knots.

The fuel storage capacity of the vessel is 30 tons which, at a guaranteed consumption of not over 0.4 pound per horsepower hour, is sufficient to carry her for a long time without refueling. Electricity is provided by one 5-kilowatt and one 7-kilowatt gasoline generating sets and also by a 100-cell Edison storage battery.

The engines gave a very satisfactory performance on the trial, running smoothly at various speeds. The accommodations for the owner and his guests are commodious and handsomely finished and the general appearance on deck gives one the impression of greater space than would be expected to be available on a yacht of this size.

Diesel Engined Lighter Shows Remarkable Economy in Operation as Compared with Steam Lighter

CONCRETE evidence of the savings possible with a Diesel engine driven harbor vessel is shown by the engine room log of the new motor lighter *Worthington,* described in our April issue. The boat has been in operation for several months so that it is now possible to judge the fuel economy of this method of propulsion. The value of these results is greatly enhanced by comparative figures taken from the records of the steam engined lighter *Daniel Webster,* previously operated by the Worthington Corporation.

An analysis of the Diesel lighter's movements and fuel consumption was made covering the month of April, 1922, with the following result:

300 horsepower main engine in operation..	75 hours 31 minutes
50 horsepower auxiliary engine in operation	105 hours 50 minutes
7 horsepower lighting set in operation....	35 hours 30 minutes
Total fuel used	1,616 gallons
Total cost of fuel used at 4 cents per gallon	$64.64

On a mileage basis the fuel cost during this month averaged 10 cents per mile. Small vessel owners will appreciate the significance of this figure.

While the preceding data are interesting from the standpoint of the fuel operating cost that has been realized in actual operation, the interest in these figures is heightened when the Diesel lighter is compared with the steam driven vessel. The following table gives comparative figures for the new Diesel lighter and the old steam lighter showing the comparative sizes, power and fuel cost:

	Steam Lighter	Diesel Lighter
Length, feet	131	133
Beam, feet	28	34
Hold, depth, feet	11	11¼
Gross tonnage	216	333
Derrick capacity in tons	12	20
Horsepower, main engine	175	300
Hours under way per month....	59 (average)	75½ (Apr. 1922)
One month's fuel cost in dollars (coal at $8 per ton).....	$410 (average)	$64.64

From this table it will be noted that while the Diesel lighter is larger both in point of tonnage and propelling power and while it was under way 75½ hours during one month, and the steam lighter averaged only 59 hours per month, still the Diesel lighter fuel cost was only slightly more than one-seventh as much as for the steam vessel. In other words, the Diesel lighter operated many more hours with an engine developing greater horsepower and used only a little over one-seventh as many dollars worth of fuel as the steam lighter. If the Diesel lighter figures are corrected to a 59 hour basis to conform to the average figures for the steam vessel, we then have $410 total cost in one case for 59 hours operation, as against $50.74 oil cost on the other. When the two figures of $410 and $50.74 per month are plotted, as in Fig. 1, the whole story of fuel cost for a year or any part of a year is shown at a glance. There are of course many savings supplementing the fuel economy which are effected by the Diesel drive that have been presented in other discussions on the subject, but in these directions, too, the Worthington lighter gives us concrete and definite facts.

The Diesel lighter log shows that she fueled on March 17 and on May 18, two months later, but still had 500 gallons of fuel oil aboard. Two months constant operation certainly means time and money saved and to this must be added the facts that the Diesel lighter spent no time out at the ash scow and no time at the water plug.

Any figures worked up on the basis of the foregoing data to show fuel consumption per horsepower per hour are apt

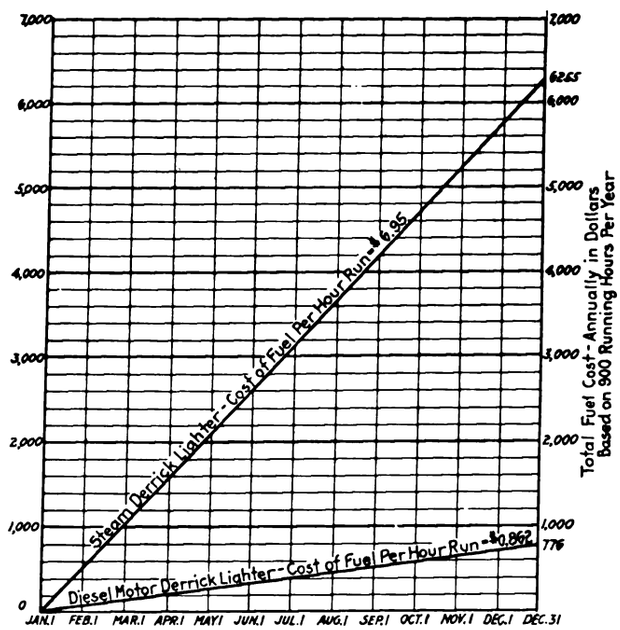
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
6,855
776
Steam Derrick Lighter - Cost of Fuel Per Hour Run - $6.85
Diesel Motor Derrick Lighter - Cost of Fuel Per Hour Run - $0.862
JAN.1 FEB.1 MAR.1 APR.1 MAY.1 JUN.1 JUL.1 AUG.1 SEP.1 OCT.1 NOV.1 DEC.1 DEC.31
Total Fuel Cost Annually in Dollars based on 900 Running Hours Per Year

Fig. 1

to be misleading because of the conditions under which any lighter must operate. A lighter must go through too many maneuvers in plying about the harbor to make a guess as to the actual load on the engines at all reliable. For instance, the Worthington lighter's log shows that the main engine was started ahead or astern anywhere from 12 to 50 times at every pier landing during the month of April. It might be mentioned in passing that this is indeed a tribute to the flexibility of the Diesel engine and certifies to its reliability in maneuvering.

The lighter has made only one long run, but this furnishes rather definite information for this kind of service. First the lighter spent 4½ hours loading cargo in Bayonne, N. J., thence she ran to pier 13 North River (a 1½ hour run) and from there in a quartering 70-mile gale to New Haven, Conn. (an 8 hour run). The trip was made with 160 tons of cargo aboard, and the entire operation from Bayonne to New Haven consumed only 192 gallons of fuel. At 4 cents per gallon the cost was $7.68 for fuel burned during the entire trip. At another time 65 tons of pumps were unloaded and dropped into the hold of the steamer with 64 cents worth of fuel.

SETTLEMENT WITH BRITISH MINISTRY.—Chairman Lasker of the Shipping Board has announced that negotiations with the British Ministry of Shipping for settlement of claims, arising out of transactions during and after the war, have been concluded by the payment by the British Ministry of Shipping to the Shipping Board of $12,000,000.

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Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Cause of Break at Point of Admission on High Pressure Indicator Card

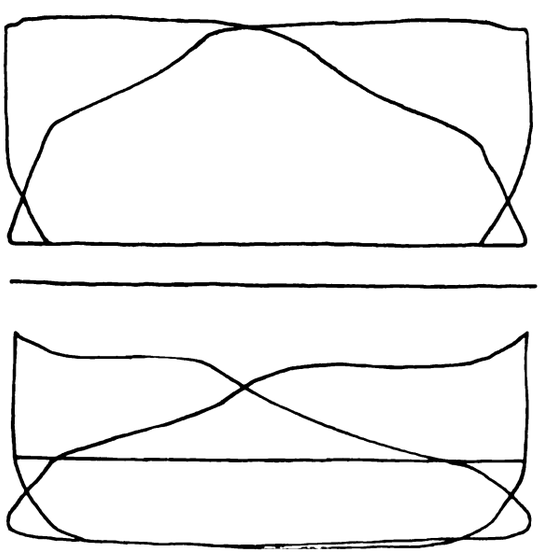
Q. (1164).—I am sending two indicator diagrams taken from an 18-inch by 38-inch by 26-inch compound condensing marine engine operating at 145 pounds steam pressure and 25-inch vacuum, 91 revolutions per minute at ⅝ cut-off. The high pressure card was taken with a 70-pound spring. What I am particularly interested in is to determine the cause of the break at the point of admission on the high pressure card.

At the time this card was taken, the boat was pulling a tow, and on the previous day's run, when the boat was running light and the engine turning 103 revolutions per minute, the card at the point in question was perfect.

My explanation is that there is lost motion in the valve gear and, under the load and slower speed, the valve overreached, causing lap and late admission. Another explanation is that these breaks were caused by condensation in the cylinder, to which I could not agree.

I will be pleased to have any information you or your correspondents could give to clear up this point.

A. (1164).—The high pressure card accompanying this question shows a break at the point of admission. This is caused by too late setting of the eccentric, resulting, as



Indicator Cards from Compound Engine

the valve starts to open, in wire drawing. The eccentric should be set ahead of its present position.

The reason this break does not appear when running light is in all probability due to the use of an indicator spring too light for the duty required. The speeding up of the engine from 91 revolutions per minute, while towing, to 103 revolutions per minute, while running light, undoubtedly gave enough added momentum to the pencil motion or the indicator piston spring to carry the pencil above the true admission condition thus tracing a perfect card at the point in question.

It is believed that, if cards be taken with a 100-pound piston spring, the break will show when running light as well as when towing.

Problem of the Hull and Its Screw Propeller

Q. (1165).—Refering to the paper on the above subject published last year in MARINE ENGINEERING AND SHIPPING AGE:

Type 2 vessels with basic slips of first order, whose value v/V and e.h.p./E.H.P. corrected for K, plots below basic S curves on Fig. 8 will have their Zs value taken from curve 2, Fig. 7, instead of curve 1. Should K be greater than unity in the case just mentioned, use 1.26 K in formula for I.H.P.d. (Pages 454 and first column, page 456, June, 1921, issue).

If the point referred to above plots on curve S, then I.H.P.d (lower part of first column, page 456, June, 1921, issue) equals I.H.P. $\times 10^{2S}$ x 1.26K, but if it plots below the curve S, then Log I.H.P.d equals Log I.H.P. plus 2 Log K (using 1.26 K for K)—2Zp plus Z_1 where Z_1 equals Zp value for e.h.p./E.H.P. corresponding to point on S curve (Fig. 8) where v/V intersects S curve. This is the formula given on page 456, June, 1921, issue (upper part of second column).

Referring to page 454, first column and thirteenth line from bottom; what is meant by the sentence beginning "These two types and type 2 of first order of apparent slips, etc."? There seems to be no formula given anywhere for I.H.P.d when plotted point on Fig. 8 falls below "C" curves.

Referring again to page 456, second column (lower half of column): Formula for I.H.P.d (type 2 vessels, second order of slip) is stated to be Log I.H.P.d equals Log I.H.P. plus Log K²-2Zp plus Z_1 (if plotted point falls below upper set of "S" curves, Fig. 8).

In the formula at the top of the same column "2 log K" is used. Are both formulæ correct? There seems to be some discrepancy, for on page 403 of the May, 1921, issue, "2 log K" is used in explaining the reason for excess of actual power over estimated power in case of the fifth vessel, which vessel appears to fall under condition explained on page 456 of June issue, lower part of second column.

(a) What are the lower set of "S" curves (lower three of which are marked "C" and others—S-27 down to S-15), Fig 8 for? I find no formulæ for cases where plotted point falls below them (May, 1921, issue).

(b) Does e.h.p. in formulæ represent horsepower required to tow full size model? (Refer to Admiral Dyson's propeller formulæ.)

(c) Are "I.H.P.d" and "S" for types 1 and 3 vessels always determined by formulæ given in the May, 1921, issue, regardless of position of plotted point on Fig. 8? (Neglecting, of course, condition mentioned on page 553 of the June, 1921, issue.)

(d) Will tow boat propellers turn the same number of revolutions when towing as when running free, assuming tow does not interfere with flow of water either to or from propeller, and assuming steam pressures equal in both cases?

(e) Where can one find reliable tow boat propeller design data?

(f) Referring to Fig. 6, May, 1921, issue, are block coefficients on curve for type 2 hulls same as those on curve for 1 and 3 hulls, if projected on a horizontal line? For example: On curve for 1 and 3 hulls S.B.C. .50 falls on curve A = 30, will the same S.B.C. for type 2 hulls fall on curve A = 23.75 (approximate)?

A. (1165).—Your interpretation as to type 2 vessels with basic slips of the first order is correct.

The sentence referred to on page 454, beginning "These two types, etc." is in error and should read "These two types pass on down to v/V values shown by curves C, Fig. 8, etc." In connection with this sentence it should be stated that the correct location of these "C" curves has been and still is the cause of much study and uncertainty due to the scarcity of data of vessels showing true dispersal of the thrust column. For example, the destroyer now being classed as a type 1 vessel seems to fulfil the requirements of that class, yet due to the fact that it does not show a genuine dispersal of the thrust column nor cavitates at the points expected when referred to the "C" curves, brings a doubt as to whether it is not in reality a type 2 vessel.

When the plotted point falls below the "C" curves of Fig. 8 a "C" curve below those shown may be plotted in the following manner: Choose as a basis some curve such as S = .10. If it is desired to plot say an S = .05 curve, the value on that curve corresponding to any e.h.p./E.H.P. would be [(1-.10)/(1-.05)] × (the value of v/V on the S = .10 curve corresponding to the particular e.h.p./E.H.P. being used.)

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The formlua referred to in the second column of page 456 is in error and should read: Log $I.H.P_d$ = log I.H.P. + 2 log K — 2 Z_p + Z_1.

(a) The lower set of "S" curves, Fig. 8, are to be used with types 1 and 3 vessels and in exactly the same manner as the curves for type 2 vessels.

(b) The e.h.p. used in this article refers to the effective horsepower required to tow the actual vessel.

(c) The same formulæ given in the May issue are used for "$I.H.P_d$" and "S" for types 1 and 3 vessels regardless of position of plotted v/V and e.h.p./E.H.P. points.

(d) Revolutions towing will be less than when running free under conditions cited.

(e) There have been several instances where data were taken while towing United States naval vessels but in no case were the runs made over the measured mile, the speed having been estimated. In order to make an analysis of the data, since no overall effective horsepower was obtained, it would be necessary to add together the effective horsepower of each individual vessel, when available from model tank experiments, under the towing conditions and to this add the estimated power required to overcome the resistance of the idle propellers.

(f) The curve for type 2 vessels was intended for use in cases where information as to a vessel's general dimensions (such as displacement) was incomplete. It was plotted with values of 2 LAB/H and S and bears no known relation to the curve for types 1 and 3 vessels. Since the publication of this article the type 2 curve was abandoned and the types 1 and 3 curve was used for type 2 vessels as well.

NEW BOOKS

MOTORSHIP YEAR BOOK, 1922. Size, 7½ by 10⅜ inches. Pages, 100. Illustrations, 42. New York, 1922: Miller, Freeman and Company.

Compiled as a standard reference book on oil engines and oil-engined vessels for designers, operators, owners and students, this volume contains a complete detailed register of the motorships of the world, lists of marine Diesel and marine surface ignition engine builders of the world, the American Bureau of Shipping rules for the construction of marine internal combustion engines, Lloyd's revised rules for the construction and survey of Diesel engines and their auxiliaries, the United States Steamboat Inspection Service rules for the licensing of engineers of motor vessels and several articles dealing with matters of interest in the motorship industry.

Of chief value is the data given regarding motorships in existence. The list of vessels has been arranged chronologically according to the year in which the ships were built. As each item is numbered serially and an alphabetical index with the serial numbers accompanies the Register, the data regarding any vessel can be found very quickly. The Register is arranged in tabular form giving the serial number assigned to the vessel, the name of the vessel, its type, the names of the owners and the builders of the hull, the dimensions, tonnage, the number, type and make of engines, the total brake horsepower and the bore, stroke and revolutions of the engine. The Register has been carefully revised since first issued a year ago.

The book opens with a review of American motorship and oil engine construction during 1921. This is followed by a discussion of the use of tar oil fuel for Diesel engines, shaft diameters and ship conversions, exhaust piping and mufflers and forty-nine selected questions and answers for engineers about to take examinations for a marine operator's license for motorships.

LETTERS TO THE EDITOR

Wages Not the Principal Handicap

In the June issue of MARINE ENGINEERING AND SHIPPING AGE, Captain Eugene E. O'Donnell, manager, marine department, C. H. Sprague and Son, has given his opinions on the question of our merchant marine, and we believe truthfully, as far as he goes, but he has only stated a few of the reasons why we as Americans cannot meet foreign competition.

And, as we believe every American should know the truth, the whole truth and nothing but the truth, we as Americans ask that Captain O'Donnell finish his story, and as marine engineers we must demand in self-defense that the other side of the story be told.

Our reasons for asking Captain O'Donnell to finish are as follows:

First, while his figures as to the pay sheets of the two classes of ships compared with the same class of British ships are no doubt true and correct, we have only to look for a few more figures, also true and correct, and we see where Captain O'Donnell is misleading the public with the truth, but not the whole truth. The figures we ask for are the overhead or the shore expenses of the two companies operating the same class and number of ships, one American and one British; also the Shipping Board overhead for the American ships. If we can believe Admiral Benson's statement to the marine engineers in executive council in Washington, D. C., just before the wage war in May and June, 1921, we could not compete with our British rivals, if the American crews from the captain down worked for their board. Admiral Benson said that the total wages of an American crew was less than seven and one-half (7.5) percent of the total operating expense. Then a little later Senator LaFollette said from the Senate floor that at the very most it would not exceed ten (10) percent.

Now what we want is a comparison of the other ninety (90) percent. All we ask is a fair chance to prove to the world that we as American engineers can and will meet and defeat any kind of foreign competition, provided we are not handicapped with an unreasonable overhead or shore payroll.

Captain O'Donnell takes time to point out several defects in the American maritime laws, or rather what he calls defects. It is evident that he does not intend ever to sail again (if he ever did) or allow any of his boys (if he has any) to sail on anything but a passenger ship. If he did, he would not advise the several changes he has. He also thinks the subsidy bill should not demand more than forty (40) percent of Americans on American ships.

The statement that it will be hard to man our ships with Americans is not true. While it may force some deck and engine room help to become Americans, they are here and eligible and we claim that if this country is not good enough for them to become citizens of our country then the ships of our country are too good for them to sail on.

Portland, Ore. J. R. SNEE, Secretary,
Marine Engineers' Beneficial Association No. 41.

Shore Expenses of American Steamship Companies

You have been kind enough to send me an advance copy of Mr. J. R. Snee's letter on "Wages Not the Principal Handicap." This was sent to me in order that I might make reply in view of the fact that he has taken issue with a paper which I presented before the Society of Naval Architects and Marine Engineers, entitled "The Operating Problems of the American Shipowner."

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As Mr. Snee's letter deals in generalities and is not specific in character, I can hardly accept it as constructive criticism and while I do not desire to enter into a controversial discussion purely on the basis of generalities I shall, however, in this instance attempt to make a fitting reply.

Mr. Snee assumes to believe that the operating problem of the American shipowner so far as wages are concerned is one that is not entirely confined to the sea-going personnel, but rather emphasizes the fact that the overhead or office expense in the operation of a steamship line is largely responsible for our inability to compete in international trade. In this regard it may be said:

Shore expenses of American and British steamship companies in the operating and traffic offices differ only as salaries and wages on shore are generally different in America and Great Britain. It is doubtless true that American salaries and wages of the shore force are usually higher. It is also true that many current assertions as to the extravagantly high salaries paid American shore officials are grotesquely untrue. As a rule, only one man in an American shipping organization, except one of very great size, has a substantial salary, and he is the executive head who must bear not only executive but heavy financial responsibilities.

Only the Shipping Board can give the "overhead" of its steamers, for which your correspondent asks. As to private companies, I can speak only of my own case. With fifteen persons in our shore office, we are operating 4 steamers of private ownership and 6 steamers for the Shipping Board besides acting for 12 steamship companies calling at this port. I doubt very much whether a given number of British steamers is operated by a smaller force or with an overhead less than our own. The wages of officers and crews afloat have been emphasized in discussions of the merchant marine because these officers and men are so much more numerous and their payrolls are so much greater in the aggregate than those of the relatively small number of people employed ashore.

Wages and costs of subsistence represent together from 12 to 15 percent of the total operating costs of our cargo steamers. Fuel and supplies may be purchased for both American and foreign ships in the world's cheapest markets wherever they happen to be. The wages and subsistence differences are the main differences between our ships and their competitors under the Shipping Board's policy of selling its cargo steamers on the basis of the market prices of the world.

There was no purpose in my paper written for the Society of Naval Architects and Marine Engineers to exaggerate in any point the wage handicap upon American shipowners. We are not paying our good officers any more than they are worth. I did not say nor do I think that the Shipping Board should not demand more than 40 percent of Americans on American ships—I suggested that that was a good practicable point from which to work to the larger requirements of the present shipping bill, which provides that after two or three years at least two-thirds of the unlicensed men in the deck and engine departments must be citizens of the United States. Nor do I ask for any change in the La Follette seamen's law that would make it more difficult for any Americans to go to sea. On the contrary, all we ask in the way of amendments to that law are those that will give American ships and American boys a fairer chance and a more efficient discipline on shipboard. With this I am sure Mr. Snee will as a practical engineer agree.

With reference to the defects in our navigation laws, the recommendations for correcting these defects were made by a competent committee as the result of careful study of the subject, and in further consequence of the suggestions made by practical shipping people including owners, operators, licensed deck and engineer officers and others. These recommendations simply attempt to place us upon a parity so far as our navigation laws are concerned with our principal competitors.

There is no desire on the part of anyone, I am sure, to lessen the requirements for safety of life at sea but this report in effect and in the light of present day experience in reality increases those safeguards in a manner that is comparable with the best modern practice.

The gentleman's statement that it is evident that I do not intend to ever sail again (if I ever did) or allow any of my boys (if I have any) to sail on anything but passenger ships is innuendo and unworthy of an answer. Let me say for the gentleman's benefit, however, that I have sailed for a good many years—from boy to master. My ancestors for several generations were shipbuilders, shipowners or sailors and I should not be in the least surprised to find that my boy in due course will follow in the footsteps of his ancestors and I have no fear for him or any other boy, if the splendid suggestions of the navigation committee are adopted.

Captain Eugene E. O'Donnell,
Manager, Marine Department,
Boston, Mass. C. H. Sprague & Son.

OBITUARY

Captain Humphrey Jones, a retired sea captain and for seventeen years an inspector of hulls in the United States Steamboat Inspection Service, died recently at his home, 417 East Twenty-fifth street, Brooklyn, N. Y., aged 73.

David Wood, a well known ship draftsman who was admired and respected by all with whom he came in contact, died at the Harbor Hospital, Bath Beach, Brooklyn, on Tuesday, June 27. Mr. Wood was born in Glasgow, Scotland, and served an apprenticeship as a draftsman in the shipyard of Charles Connell and Company. Afterwards he worked at the yards of Henderson Brothers, John Brown and Company on the Clyde and at the Harland and Wolff yard at Belfast.

David Wood

He came to the United States in 1896 and since then had worked at the following places: William Cramp and Son's Ship and Engine Building Company, Harlan and Hollingsworth, Newport News Shipbuilding and Dry Dock Company, Baltimore Dry Docks and Repair Company, Brooklyn Navy Yard, Bureau of Lighthouses, Emergency Fleet Corporation and the Federal Shipbuilding Company.

Mr. Wood was perhaps best known at the Brooklyn Navy Yard where he served 16 years. Recently, however, he had been connected with the Federal Shipbuilding Company and it was while at work at that plant on June 20 that he was taken ill. After receiving temporary treatment at the yard's hospital, he recovered sufficiently to be able to go to his home in Brooklyn where it was hoped that a few days' rest would set him on his feet again. On June 22 he was taken to the Harbor Hospital where he was operated on for appendicitis. After the operation he seemed cheerful and hopeful of being restored to health but unfortunately pneumonia set in from

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which in his weakened condition he was unable to rally.

Funeral services were held at the undertaker's chapel on Ashland Place, Brooklyn, which were attended by a large number of his friends and he was laid to rest on the following day with full Masonic rites.

DAVID D. FARIS, appointed on July 1 as manager of the marine department of the Westinghouse Electric & Manufacturing Company, died suddenly in his office at the East Pittsburgh works of the Westinghouse Company on July 10, from apoplexy. Mr. Faris was born in Wheeling, W. Va., and was educated in the public schools and at the Linsly Military Academy in Wheeling, from which he graduated in 1896, going to work almost immediately for the Bellaire Steel Works, Bellaire, Ohio. At the outbreak of the Spanish-American War, he joined the army and went to the Philippines. Upon his discharge in 1899, at the end of the war, he took up a commercial course in the Elliot Commercial School in Wheeling and then came to Pittsburgh to work in the purchasing department of the National Tube Company.

David D. Faris

In 1901 he entered the employ of the National Cash Register Company in Dayton, Ohio, and a few months later became connected with the engineering department of the Pressed Steel Car Company in McKees Rocks, Pittsburgh. In May, 1904, he was employed in the production department of the Westinghouse Machine Company at East Pittsburgh and then was transferred to the sales department, where he remained for five years. He then was assigned to the Atlanta office as sales engineer, and later was engaged in the Chicago office. In 1912 he was given charge of the Detroit and Indianapolis offices of the Westinghouse Company. When the Westinghouse Machine Company was absorbed by the Electric Company in 1915 Mr. Faris returned to East Pittsburgh and was made assistant to the manager of the power department of the company. In 1919 he became assistant manager of the marine department, in which position he remained until his recent promotion.

Mr. Faris was an associate of the American Institute of Electrical Engineers, the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers.

PERSONAL MENTION

CHARLES C. MOSS, former inspector of repairs for the Munson Steamship Line, is now associated with Gibbs Brothers, Inc., checking up the work on the turbines of the *Leviathan* at the Newport News Shipbuilding and Dry Dock Company's yard, Newport News, Va.

T. PARK HAY is in charge of the United States Shipping Board Emergency Fleet Corporation office recently opened at 827-28 Marquette Building, Chicago, Ill. Mr. Hay was formerly manager of the St. Louis office of the Emergency Fleet Corporation. Harold C. King is his assistant. Besides acting as an intermediary between agents of American ships and exporters and importers, the office will promote cooperation between the railroads and the merchant marine.

CHARLES M. SCHWAB, chairman of the board of the Bethlehem Steel Corporation and of the Bethlehem Shipbuilding Corporation, Ltd., has been elected chairman of the board of directors of the Chicago Pneumatic Tool Company, Chicago, Ill., succeeding John R. McGinley, retired.

CAPTAIN W. A. HINDON has been made port captain of the United States Shipping Board, port of Boston to relieve Captain John J. Coholon, resigned. During the war, Captain Hindon was on the staff of the commandant at the Hampton Roads Naval Base and also served as executive officier on several navy transports.

FRANK E. SCOTT was appointed on July 1 by the United States Shipping Board Emergency Fleet Corporation as general western representative, with headquarters at Chicago, of the following steamship lines: United States Lines, Baltimore Steamship Company, W. A. Blake & Company, Black Diamond Steamship Company, Export Transportation Company. These companies operate Shipping Board tonnage from the North Atlantic to the United Kingdom and Continental European ports, giving frequent and regular service from all important North Atlantic ports to the important ports in the United Kingdom and on the Continent.

W. L. BUNKER, formerly manager of the Egan Refractory Engineering Company, has been appointed superintending engineer of the United States Lines. Mr. Bunker is a Californian and began his engineering career about thirty years ago. Eight years spent in the shops and drawing offices of the Union Iron Works Company of San Francisco gave him a good foundation for practical marine work and this was followed by several years in the transport service, beginning at the time of the Spanish-American war. He then went with the Pacific Mail Company, serving twelve years on passenger ships running to the Orient, going through all the grades of engineering and serving for the last six years as chief engineer of the S. S. *Manchuria*. Mr. Bunker then went with the Great Northern Pacific Steamship Company, where he worked for three years as chief engineer and superintending engineer. His next position was that of chief inspector of the United States Shipping Board in San Francisco, which he left after six months to enroll as a lieutenant in the Navy, where he served for sixteen months, leaving with the rank of lieutenant-commander. He was one of the first reserve engineers to receive this rank and he left the Navy with an excellent war record, having received a letter of recognition from Secretary of the Navy Daniels.

W. L. Bunker

Upon leaving the Navy, Mr. Bunker again joined the United States Shipping Board as chief inspector in charge of construction and repairs in Philadelphia and New York. After a year and a half in this position, he left to join the Lord Dry Dock Corporation, where he remained for eighteen months as general manager. Again, after one year as marine surveyor in New York, Mr. Bunker became manager of the Egan Refractory Engineering Company, the position which he left to take his present position.

Much of Mr. Bunker's marine experience has been with the handling of passenger ships. He is a diligent worker and has earned for himself the enviable reputation of living up to his motto of "A Square Deal for Everyone."

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Shipbuilding, Reconditioning and Operation

Port Expansion, Passenger and Freight Activities and Other Notes of Interest in All Branches of the Marine Industry

Business Improvement

A PRONOUNCED upward turn from the low mark of the post-war ebb in the tide of shipyard business is shown by figures compiled by MARINE ENGINEERING AND SHIPPING AGE for the first half of 1922.

From January 1 to July 1 there has been reported ship construction and repair work as under contemplation having a total estimated value of $73,782,517 and contracts placed for similar work during the same time amounting to $28,905,186.

Figures for the first three months of the year showed $34,927,000 reported as work in contemplation and $14,930,206 in actual contracts placed. For the quarter ending July 1 the figures are $38,855,517 and $13,974,980 respectively.

In addition to these figures, there is at present every indication that contracts for at least seven new combination passenger and freight ships, as well as a number of other types of commercial vessels, will be placed this year.

There is also a strong possibility that orders may be placed in this country for either submarine torpedo boats or submarine mine layers for foreign accounts. Tentative bids have already been received or requested from American builders. The award of any one of the several contracts being considered in this connection would involve many millions of dollars.

Reconditioning of Agamemnon and Mount Vernon, Involving Millions, Receiving Serious Consideration

Washington Officials Understood to Be Investigating Probable Cost of Putting Ships in Service—Action on the President Grant May Be Deferred

FROM $3,700,000 to $4,500,000 will be required for reconditioning of the steamships *Agamemnon* and *Mount Vernon*, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. It is learned that the question of putting these vessels into shape for service is receiving serious consideration in Washington, as it is believed that the operation of these or similar ships will be necessary to provide running mates for the *Leviathan*.

Unofficial estimates of the cost of overhauling the *Agamemnon* and the *Mount Vernon* placed the totals, including general specifications, oil fuel installation, stewards' supplies and ship furnishings at about $2,500,000 for the former and slightly over $2,000,000 for the latter. This reconditioning would provide for 22 knots speed, using oil for fuel.

For reconditioning the same vessels for 18 knots speed, using coal for fuel, the total figures for the *Agamemnon* would be close to $1,900,000 and for the *Mount Vernon* $1,800,000.

It is believed that the reconditioning of the *President Grant*, including general specifications and stewards' supplies and ship furnishings, would cost about $900,000.

It is understood that in the case of the *Mount Vernon* and the *Agamemnon* preliminary estimates were prepared on a basis of operating the ships at a speed of 22 knots, using oil for fuel, with an alternative estimate of service at 18 knots, using coal for fuel.

It is probable that three months will be required for the preparation of plans and specifications on the *Mount Vernon* and *Agamemnon* and the actual work of reconditioning these two vessels as coal burners would require six months' time and, with oil burners, seven months.

The ships have an over all length of 706 feet 6 inches; length between perpendiculars, 680 feet 4 inches; breadth, 72 feet; depth, 44 feet 2 inches and a gross tonnage of 19,503.

As oil burners, passenger accommodations can be provided for about 600 first class, 300 second class and 600 third class passengers, while, as coal burners, accommodations can be provided for over 500 first class, 300 second class and 350 third class passengers.

Steamship Comus To Be Converted Into Oil Burner

THE steamship *Comus*, of the Southern Pacific Steamship Company, went to the plant of the Robins Dry Dock & Repair Company, Brooklyn, N. Y., of the Todd Shipyard Corporation, where she will be converted from a coal to an oil burning ship.

$1,840,000 Job Awarded Newport News Shipyard

THE Newport News Shipbuilding and Dry Dock Company, Newport News, Va., has been awarded the contract for the construction of two combination passenger steamers for the Ocean Steamship Company, of Savannah, following the opening of tenders at Pier 35, North River, New York, on June 29. There were eleven bids submitted for the work, the Newport News price being $920,000 for each ship.

The vessels will be built of steel, the propelling machinery consisting of inverted, direct acting, triple expansion, surface condensing engines, having cylinders 26, 43 and 72 inches diameter by 48-inch stroke, designed to develop 2,900 indicated horsepower, steam being supplied by four single-ended, cylindrical, return tube boilers. The ships, which are to be similar in type to the company's steamships *City of St. Louis* and *City of Montgomery*, are for delivery in 1923, the first by September 1 and the second by October 1. They will accommodate about 228 passengers each.

Diesel Yacht Contract Awarded Newport News Yard

NEWPORT NEWS, Va. (Special.)—The Newport News Shipbuilding & Dry Dock Company has been awarded a contract for the construction of a seagoing Diesel yacht, 172 feet by 26 feet by 12 feet. The vessel will be propelled by two 350 horsepower Winton Diesel engines.

The yacht was designed by the firm of Cox & Stevens, naval architects, of New York City. It is understood she will be named the *Ohio* and will cost close to $350,000.

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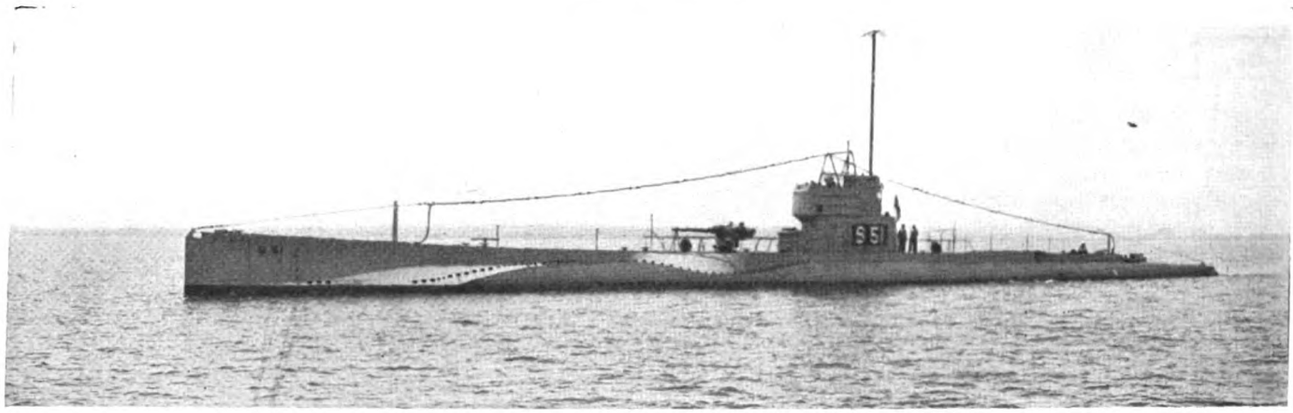

S-51, After Completing Successful Trials

Submarine S-51, Last of the Lake Company's Construction Program, Is Officially Delivered

THE submarine *S-51* built by the Lake Torpedo Boat Company, at Bridgeport, Conn., was officially turned over to the United States Government by that company at the Lake shipyard, on Saturday, June 24. With a band playing and flags flying, Lieutenant Commander W. S. Haas, U. S. N., assumed active command of the vessel. Simon Lake, designers and other engineers of the contracting company and a large party of invited guests witnessed the ceremony.

The turning over of the *S-51* to the Navy completes the Lake Company's present building program. The ship is the last word in submarine construction and gave a highly creditable performance when she ran her sea trials recently.

Gahagain Company Takes $491,904 Job for 12 Sea Scows

THE W. H. Gahagain Company, of Brooklyn, New York, has been awarded the contract by the City of New York for the construction of twelve seagoing side dumper scows for use by the Department of Street Cleaning. The company's bid was $40,992 as a unit price with a total figure of $491,904.

The specifications provide for a heavily constructed wooden boat having a length inside of fenders of 134 feet; breadth outside to outside of side planks, 37 feet; depth molded to center top of deck plank to bottom of bottom plank, 14 feet; the boats to be fully equipped.

Conversion of San Lorenzo Awarded To Sun Company

THE Sun Shipbuilding Company, of Chester, Pa., has been awarded the contract to insulate and convert the steamship *San Lorenzo*, of the New York and Porto Rico Steamship Company, into an air-cooled fruit carrier, following the opening of bids at 25 Broadway, New York city, on July 7. The Brunswick Refrigerating Company's machinery will be used and when completed the ship will have about 120,000 cubic feet of space available for cargo. She will be returned to service between New York and San Juan. The successful bid was $138,768, the work to be done in 60 running days.

The steamship company has also purchased a new high-pressure cylinder for the *San Lorenzo* from the Sun Company, which will be installed in the course of the overhauling and during the layup the ship will be classed by the American Bureau of Shipping.

Newport News Yard Gets Middlesex for General Overhauling

THE Newport News Shipbuilding & Dry Dock Company was awarded the contract for overhauling the steamer *Middlesex*, of the Coastwise Transportation Company, following the opening of bids at the office of Frank S. Martin, naval architect and marine engineer, of 25 Broadway, New York City. The contract provides for a long drydocking job including considerable steel work. The bids submitted were as follows:

Newport News Shipbuilding & Dry Dock Co.	$134,986	60 days
Morse Dry Dock & Repair Co.	155,000	57 days
Robins Dry Dock & Repair Co.	157,000	70 days
Alderton Dry Docks	160,000	55 days
Tietjen & Lang	162,354	72 days
James Shewan & Son	165,000	43 days
Bethlehem Shipbuilding Co.	249,800	65 days

Freighter to Be Built by American Yard, Cleveland

THE American Shipbuilding Company, of Cleveland, Ohio, has been awarded a contract by the Pandor Steamship Company, of Cleveland, for the construction of a steel freighter of 12,000 deadweight tons, similar in type to the vessels the shipyard now has under construction for other lake carriers.

The vessel will have a length between perpendiculars of 580 feet, beam 60 feet and depth 32 feet. She will be propelled by a triple expansion reciprocating engine, and cost about $800,000.

Bethlehem Plant Awarded Two Ships For Eastern Lines

THE contract for the construction of two coastwise freighters for the Eastern Steamship Lines, Inc., of Boston, Mass., has been awarded to the Bethlehem Shipbuilding Corporation at a total price of $287,000 each. Bids for the construction of one, two or three of these ships were received on Wednesday, June 14. Construction work will start immediately at the Sparrows Point plant of the Bethlehem Corporation, the first ship to be built in 180 days and the second ship in 200 days.

The ships will be of the hurricane shelter deck type, having an overall length of 233 feet 3 inches, length between perpendiculars 221 feet 6 inches, beam molded 38 feet, load draft 17 feet, 1,400 deadweight tons and developing a speed of 11½ knots. It is understood that the propelling machinery will consist of reciprocating engines purchased from the Shipping Board and built by the Hooven, Owens, Rentschler Company. Steam will be supplied by two, oil burning, single ended, Scotch boilers of the two furnace type, delivering steam at 190 pounds working pressure.

The vessels were designed by Theodore E. Ferris, naval architect of 30 Church Street, New York City.

Robins Yard Gets S.S. President Pierce on Bid of $229,000

THE Robins Dry Dock & Repair Company of the Todd Shipyards Corporation with a price of $229,000 was awarded the contract of reconditioning the steamship *President Pierce*, formerly the *Hawkeye State*, following the opening of bids by the Shipping Board, 45 Broadway, New York, on June 27. The work includes extensive hull and engine repairs.

Self-Unloading Collier Is Contracted For

James Playfair, of Midland, Ontario, has signed a contract with the Midland Contracting Company for the construction of a self-unloading canal sized collier.

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Building of Two Steel, Turbo-Electric Ferries Under Way

MARKING the first steel ship contract work undertaken at any Los Angeles yard since the war, the first plans for the keels of two steel double ended ferry boats were laid on June 29, at the plant of the Los Angeles Shipbuilding and Drydock Corporation. The construction contract amounts to $586,000, outside of equipment, and was secured by the local yard in sharp competition with northern shipyards.

The vessels are to be built under the supervision of John B. Matthews, naval architect and engineer, who designed them as the first turbo-electrically driven ferryboats ever laid down in any yard. The propelling machinery is of a similar type as that used in modern warships and is said to provide a saving of 30 percent in horsepower as well as to effect a great economy in fuel and simplicity in operation. The construction work promises to provide employment for several hundred men and this activity taken in connection with the establishment of a modern lumber yard, with sawmills and box factories at the same plant, is expected to re-establish the Los Angeles yards in their old position as among the largest employers of labor in the harbor district.

Bids for Seven Millions in Submarine Mine Layers Requested from Contractors in America

Prices Asked by South American Government for Construction of from Three to Five Vessels in Addition to Undersea Torpedo Boats

A SOUTH AMERICAN government is again in the American market for a number of submarine vessels having an estimated total value of $7,000,000, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. Argentine, Brazil and Chile have already received tenders from American builders for the construction of from six to twelve submarine torpedo boats of the latest type, the cost of which would range from five to eighteen million dollars, the latest development being a request for estimates on three, four or five submarine mine layers. It is believed that these latter vessels would involve the expenditure of from $5,000,000 to $7,000,000.

Proposals for vessels of the mine-layer type will probably provide for a submarine about 200 feet in length, driven by two 1,000-horsepower oil engines developing a speed of from 15 to 16 knots.

Each vessel would be equipped complete with auxiliary machinery, including electric motors, storage batteries, mine handling mechanism, pumps, wireless apparatus, etc. Unofficial figures give the approximate displacements of these proposed boats as follows: Net submerged tons, 870; surface displacement, 720; submerged depth, 200 feet.

Contract Placed for Rebuilding of C. & O. Pier at Norfolk, Va.

The J. T. Nuchols Company, of Richmond, Va., has been awarded contract for rebuilding the Chesapeake & Ohio pier and warehouse, burned at Norfolk, Va., several months ago. The amount of the contract has not been made public, but it is believed to be less than the $125,000, which was the amount of the first estimate.

The new pier and warehouses will be fireproof, constructed of reinforced concrete and steel. It will be 450 by 52 feet, approximately, and will more than compensate for the space lost

United States Only Country to Show Increase in Shipbuilding During the Past Three Months

Figures of Lloyd's Register of Shipping Credit United States With Gain from April 1 to July 1—World Shipbuilding Below Pre-War Level

WORLD shipbuilding today is actually below the pre-war level, says a statement just issued by Lloyd's Register of Shipping. The decrease in production has been steady since the fall of 1919, and the volume of new orders continues to be far below the completion of orders in hand.

While the returns for the quarter ended July 1 show that the aggregate of contracts in hand is nearly 800,000 gross tons more than the total at July 1, 1914, so many suspensions of work have been directed by those who placed the orders that the actual volume of construction actively under way is slightly below the pre-war figure.

Although there has been a sharp shrinkage in the gross aggregate of tonnage in hand during the past three months, Lloyd's Register points out, the total for the shipyards of the United States shows a small gain. On April 1, the American aggregate was lower than before the war, but on July 1 it was slightly above the pre-war figure. This country, however, was practically the only one in the world to show a gain during the past quarter.

The gross aggregate of tonnage on July 1, as compared with the previous quarter, was as follows (in gross tons):

	July 1	*April* 1
United States.....	150,623	136,266
United Kingdom.....	1,919,504	2,235,998
Other countries.....	1,165,303	1,307,358
World total.....	3,235,430	3,679,622

Stoppages ordered on this work fell more heavily on British shipyards than on those of all the other maritime nations combined, says Lloyd's Register, the result being that, while the actual British total is nearly 300,000 tons below the pre-war figure, the aggregate of the other shipbuilding countries is about 250,000 tons higher than in 1914. The following shows the result of the last quarter's suspensions, in gross tons:

	Britain	*Others*
Work contracted.....	1,919,504	1,315,926
Less suspensions.....	481,000	290,000
Actual work.....	1,438,504	1,025,926

The actual construction under way at present, as compared with that just before the war, shows how British shipyards have been affected:

	July 1, 1914	*July* 1, 1922
United Kingdom.....	1,722,000	1,438,504
United States.....	148,000	150,623
Other countries.....	626,000	875,303
World total.....	2,496,000	2,464,430

The world construction now actually under way shows a decline of nearly 5,600,000 gross tons from the peak, which was attained in September, 1919, when 8,048,000 tons were being built. Lloyd's Register states. This country's present total of 150,000 tons, compared with the high level of 4,186,000 tons reached in the first quarter of 1919, shows a decrease of more than 95 per cent.

Bethlehem Begins Construction of Two 20,000-Ton Ships

THE Bethlehem Shipbuilding Corporation has begun the construction of two 20,000-ton cargo ships at their Union plant, San Francisco, California. These ships are to be combination ore and coal carriers similar to the ore and oil carriers already built by that company.

The vessels will be named the *Chilore* and *Lebore*. They will each have an over all length of 571 feet 6 inches, length between perpendiculars 550 feet 1 inch, beam molded 72 feet. The propelling machinery will consist of two Bethlehem-Curtis type turbines developing a maximum of 5,000 horsepower. Steam will be supplied by three single-ended Scotch boilers burning oil for fuel and developing a working pressure of 220 pounds. The cargo space of each ship will have a total capacity of 911,856 cubic feet.

Virginian Railway Will Build Three Million Dollar Pier

ACCORDING to announcement by C. H. Hix, Vice-President of the Virginian Railway, the railway will build a new coal pier at Sewall's Point terminals, more than doubling the capacity of the plant to dump coal. The expenditure involved will be about $3,000,000. Bids will probably be asked in the near future as plans are now being prepared. Mr. Hix said that he hoped to have the preliminary work on the pier started in two months and that it should be completed in two years.

Construction of the new pier will add about one-fourth to the coaling facilities of the port.

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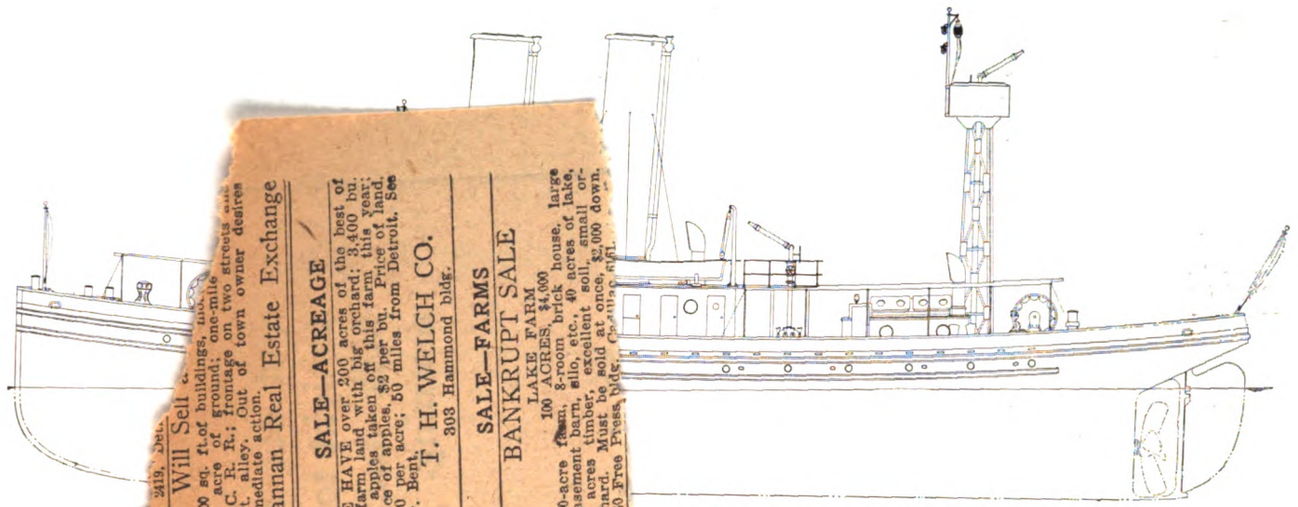

...at to Be Built for New Orleans

New Pa...

Theodore ... Prepare ...

THE construction of ... nation passenger and ... being contemplated by ... and Porto Rico Steamship C... ing to official information ob... RINE ENGINEERING AND SH... Theodore E. Ferris, naval arc... Church Street, New York City... commissioned to prepare plans and specifications and it is probable that bids for the contract will be asked in from three to five weeks. It is believed the cost of the proposed vessel will be close to one million and a ...nt prices of materials. ...inary figures, the ship ... in length, propelled ... sufficient power to ...ts. Accommodations ...proximately 200 first ...ssengers, the public ...quipment being designed for the maximum of convenience and comfort.

The new steamship will be of a type similar to the company's ship *San Lorenzo*, now being reconditioned at the plant of the Sun Shipbuilding Company.

...n by ... Rico Line

...ommissioned to ... Be Asked

...AND CONTRACTS

Johnson Plant to Build Fireboat for New Orleans

THE Johnson Iron Works, Dry Dock & Shipbuilding Company, Inc., of New Orleans, La., has been awarded the contract for the construction of a steel screw fireboat for the city of New Orleans at a price of $264,447, the vessel to be completed in 220 days. Bids for the construction of this boat were opened on June 29.

The vessel will be 138 feet 6 inches long, driven by compound engines with cylinders 20½ inches and 46 inches in diameter and 28 inches stroke, steam being supplied by two watertube boilers, fitted to burn oil for fuel. She will be equipped with four turbine-driven fire pumps of a combined capacity of 10,000 gallons per minute and was designed by and will be built under the supervision of Cornell and Matthews, naval architects and marine engineers, of Philadelphia.

Government to Order New Steam Driven Tender

BIDS will shortly be invited by the Bureau of Lighthouses in Washington, D. C., for the building of a new steel, stern-wheel tender for the Ohio and Monongahela Rivers, with headquarters at Cincinnati, Ohio.

The new vessel will replace the *Goldenrod*, now operating in these waters, and will be named the *Greenbrier*. She will be 165 feet overall, 140 feet length of hull, 32 feet 6 inches beam over the guards, and will draw 32 inches when in light steaming condition, 42 inches when fully loaded.

The motive power will be furnished by two horizontal high pressure steam engines operating at 200 pounds working pressure and horizontal flue boilers with natural draft.

Steam heating, hot and cold water service, electric light and steam steering gear will be provided. A noticeable feature in the design is two kerosene burning ranges in the galley, the use of which eliminates much of the heat of coal ranges and avoids the carrying of hard coal for cooking.

Reconditioned Fireboat Passes Successful Tests of Equipment

TESTS held recently on the New York fireboat *Thomas Willett*, at the Clinton plant of the Todd Shipyards Corporation, were pronounced highly satisfactory by Fire Chief J. J. Henry, consulting engineer of the department.

The *Thomas Willett* has just had new turbines and pumps installed by the Todd Corporation, and in the presence of expert engineers from the fire department, the National Board of Underwriters and Clinton Dry Docks, Inc., the boat gave a performance that Chief Henry said was better than he had ever seen in his thirty years experience.

At a pressure of 300 pounds, the pumps discharged 4,700 gallons of water per minute; at a pressure of 175 pounds, the pumps delivered 7,500 gallons per minute; at a pressure of 150 pounds, the pumps delivered 9,200 gallons of water per minute.

The fireboat's three turrets threw a 3-inch stream a distance of 400 feet, and with six stand pipes in operation six 2-inch streams of water were thrown a distance of 200 ft.

Those present at the tests, which lasted four hours, were:—Chief E. J. Worth, Chief J. J. Henry, Herbert Tracey, Fred Thompson, Lieut. George McNear of the New York Fire Department, F. A. Raymond, N. N. Walpert, H. E. Newell of The National Board of Underwriters, Paul D. Goodman, J. Hollander, W. F. Mayer, George Worley, Frank Howell, George J. Robinson, Frank Taylor, Joseph Haig and J. Herbert Todd.

Contract for Three Tugs Goes to Tebo Plant

Orders for the construction of three steel, single screw tugboats for the New York Central Railroad have been placed with the Todd Shipyards Corporation, the lowest bidder. Construction will be commenced within a few days at the Tebo plant, in Brooklyn, and delivery is expected to be made by the end of January, 1923.

The boats are to be oil burning equipped with Todd mechanical oil burners. They will be 108 feet overall length, 25 feet 6 inches beam, 12 feet 9 inches molded depth.

Business Address

The Mahr Manufacturing Company, of Minneapolis, Minn., makers of the "Mahrvel Line" of oil burning equipment, have arranged to have W. H. White take care of their New York business. His offices are located at 56 Murray street, New York.

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Marine Construction News of the Month

Ship Contracts — New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Steamer Repairs, Portland, Ore.—The American-Hawaiian steamer Iowan was awarded to the Albins Marine Iron Works, Portland, Ore., for repairs.

Steam Schooner's Hull Repaired, West Coast.—The schooner Virginia Olson has been removed to the Bethlehem Shipyards to repair the damage done to her hull in collision with a submarine.

Drydocking of Steamer, San Francisco, Cal.—The steamer Johanna Smith called at San Francisco, Cal., en route to Oregon from San Pedro to go on dry dock for annual inspection and repairs.

Contracts Awarded by Shipping Board.—The Shipping Board awarded repairs to steamship Chappaqua to Maryland Dry Docks Company at $868, repairs to Standard Oil Company's tank barge American to same plant at $2,647.

Repairs at Moore Yards, Oakland, Cal.—Steam schooners Arctic and Pasadena, barkentine James Johnson and lightship No. 76 went on Moore ways for cleaning, painting and repairing.

Condenser Repairs to Steamer, Savannah, Ga.—The Wilkinson Machine Company, of Savannah, Ga., repaired condenser on Edward Munch, a sugar vessel, discharging cargo of 30,000 bags of raw sugar at the refinery, Savannah.

Steamer Overhauled, Savannah, Ga.—The same company was also awarded the contract for generally overhauling the Farnsum.

Tarker Overhauled, Portland, Ore.—The Union Oil Company's tanker Oleum, which lost two propeller blades while en route up the Columbia River, was placed on drydock at Portland, Ore., for annual overhauling and inspection.

Tankers Overhauled for Renewed Service, San Francisco, Cal.—The Standard Oil Company has decided to place a number of their idle oil carriers in service again and has sent the tanker Algonquin to Union Iron Works docks for overhauling; S. C. T. Dood at Alameda for reconditioning, and F. H. Hillman to undergo reconditioning.

Ferryboat Completely Overhauled, San Francisco, Cal.—Ferryboat San Pablo was completely overhauled, inside and out, on ways of the Bethlehem Shipbuilding Company.

Overhauling and Repairs, San Francisco, Cal.—Tanker Richmond went to Union Iron Works for overhauling and freighter Bessie Dollar to No. 4 ways, for general repairs.

New Propeller on Steamer, Oakland, Cal.—Steamer Sonoma received new propeller at the Moore yards.

Contract Awarded, Pittsburgh, Pa.—Marine Manufacturing and Supply Company received contract to re-build sidewheel ferryboat Transit into sternwheel craft. New engines are 8 by 3, high pressure. The boat, built three years ago, is in Wellsburg, Ohio—Brilliant, West Virginia, trade.

Ship Overhauled, Pittsburgh, Pa.—Steamer Elizabeth Smith overhauled at landing of Marine Manufacturing and Supply Company, Pittsburgh, Pa.

Steamer Drydocked, Sun Yards, Chester, Pa.—British steamship Slavic Prince was drydocked at Sun yards, Chester, for miscellaneous repairs.

Repairs to Steamships, Mobile, Ala.—Steamships Maquan and Jeff Davis, consigned to Trosdal, Plant & Lafonta, underwent repairs.

Freight Carriers to be Reconditioned, Atlantic Coast.—Three freight carriers of 4,200 deadweight tons each, recently bought by the Matson Navigation Company are to be reconditioned on the Atlantic Coast before going into service between San Francisco and the Hawaiian Islands. They will be converted to oil burners. The steamers are the Coverun, the Cowee and the Cowloy.

Ship Repairs, Chester, Pa.—The steamship Agwimex, of the New York and Cuban Mail Steamship Company, went to the Sun Shipyard for boiler repairs, motor alterations and miscellaneous repairs to hull and engines.

Vessel Repairs, Hoboken, N. J.—W. & A. Fletcher Company, Hoboken, N. J., was awarded the steamers Clairmont for drydocking and painting; J. R. Gordon for general repairs, drydocking, and General Gorgas for drydocking, scaling underwater body, painting and repairing damage to bottom plates, the total amount involved being about $6,000.

Contract for Sea Dumper Scows, Brooklyn, N. Y.—W. H. Gahagain Company was awarded contract by City of New York for construction of twelve seagoing side dumper scows for use by Department of Street Cleaning. Unit bid, $40,992; total figure, $491,904.

Trial Trip of S-51, Bridgeport, Conn.—Submarine S-51, built by Lake Torpedo Boat Company, at Bridgeport, Conn., was officially turned over to United States Government by that company at Lake shipyard, Saturday, June 24.

Reconditioning of Steamer, Brooklyn, N. Y.—Robins Dry Dock & Repair Company, of Todd Shipyards Corporation, with a price of $229,000, was awarded contract for reconditioning steamship President Pierce.

Construction of Freighters, Sparrows Point, Md.—Contract for construction of two coastwise freighters for Eastern Steamship Line, Inc., Boston, Mass., was awarded the Bethlehem Shipbuilding Corporation at price of $287,000 each.

Contract Awarded, Cleveland, O.—American Shipbuilding Company was awarded contract by Frandas Steamship Company, of Cleveland, Ohio, for construction of steel freighter of 12,000 deadweight tons, similar to vessels shipyard now has under construction for other lake carriers.

Collier Contracted For, Midland, Ont.—James Playfair, of Midland, Ontario, has signed contract with Midland Contracting Company for construction of self-unloading canal sized collier.

Lighthouse Tender, Washington, D. C.—Bids to be shortly invited by Bureau of Lighthouses in Washington, D. C., for building of new steel, sternwheel tender for Ohio and Monongahela Rivers, with headquarters at Cincinnati, Ohio.

Two Ferries, San Pedro, Cal.—Los Angeles Shipbuilding and Drydock Corporation is to construct two steel, turbo-electric ferries. Construction contract amounts to $586,000 outside of equipment.

Overhauling of Steamship, Newport News, Va.—Newport News Shipbuilding & Dry Dock Company was awarded contract for overhauling steamer Middlesex, of Coastwise Transportation Company. Price, $134,986 (60 days).

Construction of Cargo Ships, San Francisco, Cal.—Bethlehem Shipbuilding Corporation has begun construction of two 20,000-ton cargo ships at their Union plant. These ships are to be combination ore and coal carriers similar to ore and oil carriers already built by that company.

General Repairs to Lighthouse Tender, Los Angeles, Calif.—Lighthouse tender Sequoia was taken to Los Angeles Shipbuilding & Dry Dock Corporation for hull scaling, painting and general machinery overhauling. Her service ranges from Panama to Alaska as lighthouse tender.

Contract Awards, Maryland.—Repairs to Atlantic, Gulf & Pacific steamer Cape Romain were awarded the Maryland Dry Dock Company, steamer Hoxie, of Baltimore Steamship Company's fleet, was docked at lower plant of the Bethlehem Shipbuilding Corporation, and barge Northern No. 44 was taken into upper dock.

Contract Awarded, San Pedro, Calif.—Shipping Board awarded contract for reconditioning steamers Huron and Aeolus to Los Angeles Shipbuilding Company. Total price, $137,928.

Steamship Conversion, New York.—Mallory Line contemplates converting steamer Medina from coal to oil burner.

Reconditioning of Steamer, Hoboken, New Jersey.—San Jacinto extensively overhauled, two new triple expansion engines installed and converted to oil burner; renovation of passenger accommodations, etc. Approximate cost, $700,000. Work completed by Tietjen & Lang Shipyards.

Probable Conversion to Motorships, New York.—Munson Steamship Company will probably convert, recently purchased ships, two in number, to motorships. Expected the work will cost over $50,000 for each ship.

Morse Yard Receives Contract, Brooklyn, N. Y.—Morse Dry Dock & Repair Company, with price of $177,445, was awarded work of reconditioning steamer Buckeye State, following opening of bids by Shipping Board at 45 Broadway, New York.

Contract for Diesel Yacht, Newport News, Va.—Newport News Shipbuilding & Dry Dock Company awarded contract for construction of seagoing Diesel yacht, 172 feet by 26 feet by 12 feet. Vessel will be propelled by two 350 horsepower Winton Diesel engines.

Diesel Engine Installation.—William Cramp & Sons Ship & Engine Building Company equipped steamship Seekonk, recently purchased by them, with Burmeister & Wain engine. An order for two three-cylinder 125-horsepower mechanical-injection Diesel engines for ocean trawlers has been placed with the Atlas Imperial Engine Company by Western California Fish Company. Contract for the hulls was placed with the W. F. Stone & Son, Oakland, Calif.

Drydocking and General Repairs, San Francisco, Cal.—Coast guard cutter Seift went to Crowley's to undergo drydocking, general repairs and installation of new propeller. Army mine planter General Franklin K. Bell was also at Crowley yards undergoing a general overhauling.

Lightship Drydocked, San Francisco, Cal.—Lightship Blunts Reef was taken to Goat Island to undergo thorough cleaning and possible drydocking.

Savannah Concern Lowest Bidder on Government Dredges.—Wilkinson Machine Company, of Savannah, Ga., was awarded contract for emergency repairs on all of the government pipe line and seagoing dredges, operated in that district, at a price of $3,318.35.

Repairs to Steamer, Portland, Ore.—Steamship Santa Veronica was drydocked to replace a broken tail shaft and ship a new wheel at Portland Drydocks.

Wireless House Installed, San Francisco, Cal.—United States army transport Meiggs went to Crowley Shipbuilding Company to have new wireless house installed. Contract price for work was $5,100, and bid of Crowley Yards was lowest.

Contracts Awarded Fletcher Company, Hoboken, N. J.—Steamship Moldegaard, owned by A. H. Bull and Company, was taken to Fletcher yards for generally reconditioning; Eastern Dawn, of United States Shipping Board, for general overhauling; steamship Lebannon, owned and operated by Globe Line, for drydocking, examination and painting, etc.; Severance, owned and operated by Union Sulphur Company, drydocked, painted and generally overhauled; President Polk, owned by United States Shipping Board, for usual trip repairs. The yard also completed work of reconditioning steamship Philadelphia, formerly of the American Line, and now owned and operated by New York and Naples Steamship Company.

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SHIPYARDS AND DRY DOCKS

Floating Drydock, etc., Guaymas, Manzanillo, Mexico.—Government of Mexico plans floating drydock, marine railway and repairing equipment. Price $1,000,000.

PORT IMPROVEMENTS

Dock, Saulte Saint Marie, Ont.—A. B. McLean & Sons, Saulte Saint Marie, plans dock for unloading sand and gravel. $60,000. Work will be done by day labor.

Pier, Oakland, Calif.—City of Oakland will build pier at the foot of Market street, by day labor under supervision of R. Beebee, harbor engineer. Price $200,000.

Pier Extension, Hermosa Beach, Calif.—Election is soon to take place on $500,000 bonds for numerous improvements, including extending present pier 300 feet into ocean.

Dredging, Manitowoc, Wis.—Contract for dredging 90,000 cubic yards in Manitowoc River was awarded to McMullen & Pitz, 915 Commercial Bank Bldg., at $0.305 per cubic yard.

Harbor Wall Repairs, Buffalo, N. Y.—Three breaks in the harbor wall south of the main entrance to Buffalo harbor are among repairs and improvements listed for this summer.

Dredging, Los Angeles, Cal.—San Francisco Dredge Company, San Francisco, Cal., was awarded contract for dredging about 670,000 cubic yards in Los Angeles harbor, San Pedro.

Wharf, etc., Norfolk, Va.—Contract awarded to Raymond Concrete Pile Company, 90 West street, New York, for 34 by 1,400 feet marginal wharf and pile Jetty at Sewells Point, at price of $417,000.

Dredging, Los Angeles, Calif.—San Francisco Bridge Company, Nevada Bank Building, San Francisco, Calif., was awarded contract for dredging in Los Angeles harbor by U. S. Engineer, 725 Central Building, at price of $6,000.

Dredging, Chicago, Ill.—Fitzsimons & Connel Dredge and Dock Company, 10 South La Salle street, Chicago, was awarded contract for dredging in Calumet River, by U. S. Engineer, Room 1201, 537 South Dearborn street, Chicago, Ill.

Wharf, Midland, Ont.—Aberdeen Elevator Company, Midland, Ont., awarded contract for concrete wharf with 10 reinforced-concrete cribs and deck, to J. H. Tromanhauser, 69 Adelaide street, East Toronto, Ontario, Canada. Price $60,000.

Grain Handling System, Portland, Me.—Directors of Port of Portland, 67 Commercial street, Portland, Me., awarded contract for furnishing and installing grain handling system, to D. E. McIntire, Inc., 74 Broad street, Boston, Mass. Price $30,954.

Coal Pier, Virginia.—Virginian Railway will build a new coal pier at Seawall's Point terminals, more than doubling capacity of plant to dump coal. Expenditure will be about $3,000,000. Bids probably to be asked in near future. Preparing plans.

Harbor Improvements, Nassau, Bahama.—Taking bids for dredging channel and turning basin in harbor, 468,000 cubic yards of limestone and coral rock, 615,000 cubic yards of sand, low water depth 27 feet, tidal range 4 feet. S. H. R. Beard, harbor engineer.

Canal, Lake Charles, La.—Calcasieu Parish voted $2,700,000 bonds for deep water channel to the sea, including deepening and widening of Intracostal Canal between Calcasieu and Sabine Rivers, to depth of 30 feet and bottom width of 125 feet, also cut off near Lake Charles, and dredging Prien and Moss Lakes.

Dredging, Brooklyn, New York.—Sealed proposals were received by Superintendent of Public Works, Charles L. Cadle, at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, July 25, 1922, for dredging a portion of the Henry Street slip at Gowanus Bay, Borough of Brooklyn, New York City, N. Y.

Bulkhead Platform, New York.—A. N. Spooner & Son, Pier 11, North River, were awarded contract by J. H. Delaney, Commissioner of Docks, Pier "A," foot of Battery place, North River, for a bulkhead platform between foot of Stanton and East Third streets, at $98,400; dredging thereat, to Morris & Cummings Dredging Company, 17 State street, at $0.28 per cubic yard.

Canals Purchased by Government.—Purchase by the Federal Government of the Cape Cod and Dismal Swamp canals, now privately owned and operated, is authorized under a Senate amendment to the rivers and harbors development bill adopted recently by the Senate Commerce Committee. Under terms of the amendments the Government agrees to pay $5,000,000 cash and to assume bonds aggregating $6,000,000 face value for the Cape Cod Waterway. The Dismal Swamp Canal, which runs from Chesapeake Bay to Beaufort, N. C., would be purchased for $500,000 under the amendment.

GOVERNMENT WORK

Bulkhead Extension, San Diego, Calif.—Specification 4651—Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded contract for concrete bulkhead at Naval Base, San Diego, to Ross Contracting Company, Van Nuys Hotel, Los Angeles, Calif. Price $69,644 (120 days).

Seawall, Annapolis, Md.—Specification 4621—McLean Contracting Company, Fidelity Building, Baltimore, Maryland, was awarded contract for building seawall at Naval Academy, Annapolis, Md., by Bureau of Yards and Docks, Navy Department, Washington, D. C. Price, $14,350 (120 days).

NEW INCORPORATIONS

Gulf & Steamship Company, capital $75,000, chartered at Dover, Delaware.

The Augusta Navigation Company, capital $10,000, chartered at Wilmington, Delaware.

Observation Steamship Company, of Manhattan, capital $15,000, chartered at Albany; incorporators, E. F. Walker, H. F. Eckhardt and C. A. Polling.

The Pacific Fruit Transport Company, of New York, capital $15,000,000, chartered at Dover, Del., to operate steamships. Registrar & Transfer Company, Dover, Del., registrars.

The Shippers Exchange & Trading Corporation, of Manhattan, capital $100,000, chartered at Albany. Incorporators are V. and P. Giordano and C. R. Menille; J. M. Nolan, attorney.

American-Ukranian Corporation, of Manhattan, capital $50,000, chartered at Albany, New York, to do trade and transport business. Incorporators: W. B. Devoe, R. R. Maiden, H. S. Bracken.

Mexican Trading & Transportation Company, capital $100,000, chartered under Delaware laws, to engage in operation of boats. Corporation Trust Company of America at Wilmington, registrar.

The Backman Towing & Transportation Company, of Manhattan, capital $25,000, chartered at Albany, New York. Incorporators are: M. Anderson, E. Vorwerk and C. Backman; F. S. Johnson, 30 Church street, New York City, attorney.

Marine Equipment Company, Aberdeen, Washington, capital $1,000,000, organized for manufacture of ship furniture and furnishings. The new concern has purchased a tract of land east of Gray's Harbor and will shortly let the contract for the first unit of the factory building. New concern is only one of its kind in the West. Incorporators are: A. F. Gross, A. Bullinski, William Matis and John Trohimovich, of Aberdeen, and B. P. Kolowski, of Portland.

FOREIGN ACTIVITIES

Steamship Lines Established, Russia.—Odessa-Varna, Odessa-Constantinople, Odessa-Cardiff, and a further line between Odessa and an English port are to be established from Russia.

Tanker Launched, Caen, France.—Launching of what is said to be largest tanker in European continental yards took place at Caen, France. Vessel is 468 feet long, of 57 feet beam, with tonnage of 11,000. Named St. Boniface.

River Barge, Flardinsveld, Holland.—The Menvede Shipbuilding Company, late Van Vliet and Company, of Flardinsveld, launched a river barge of about 850 tons deadweight for Dutch owners, following which a keel for a sister-ship for the same owners was laid.

Monthly Passenger Service, France and Australia.—French-Australian Line has inaugurated new monthly passenger service between Marseilles, Melbourne, Sydney and Noumea, of New Caledonia. Company proposes placing seven or eight passenger and cargo steamers on route.

Steamship Launched, Holland.—Steamship Flandria, built for the Royal Holland Lloyd by Barclay, Curle & Co., Ltd., was successfully launched from the firm's Clydeholm yard, Whiteinch. This vessel, 470 feet long by 59 feet by 45 feet, with gross tonnage of 10,000, is for the Holland Lloyd's mail and passenger service between New Amsterdam and South American ports.

New Cargo Steamer, Holland.—The Kertosomo, the new Rotterdam Lloyd cargo steamer, built by Royal Shipbuilding Company de Schelde, Flushing, carries 3,000 deadweight tons on Summer freeboard. She is a shelter-deck steamer with forecastle, short bridge and cruiser stern. Principal dimensions are: Length, 473 feet 8 inches; breadth, 63 feet 4 inches, and depth to shelter deck, 41 feet.

Italian Shipbuilding Output.—During the first three months of the present year, the Italian Shipyards launched ten vessels of 13,743 tons. Of these five were passenger vessels of 11,788 tons, two sailing vessels of 560 tons, and five miscellaneous craft of 13,095 tons. During the same period keels were laid for one passenger steamer of 5,300 tons and one sailing vessel of 118 tons.

Steamer Launched, Belfast, Ireland.—The first-class passenger steamer City of Nagpur, designed and built for City Line fleet of Ellerman's Line, Ltd., was launched at yard of Workman, Clark & Company, at Belfast. The vessel is especially designed for passenger service between Great Britain and India and is twenty-first built by Belfast concern for Ellerman's. The vessel is more than 400 feet long and of 10,200 gross tons.

New Service, England.—November 4 will mark the beginning of a once-a-month service from British ports to Barbados and Trinidad by Elders & Fyffes, Ltd. It is proposed to arrange outward sailings in relation to sailings of the Harrison Liners Intaba and Ingoma, so as to give the West Indies a fortnightly passenger steamer service from the United Kingdom during the winter months. The Ingoma is to sail from Tilbury on or about November 18.

Scottish Shipbuilding.—During June the output from the Clyde shipbuilding yards aggregated 34,891 tons, compared with 40,476 tons in the same month last year. The half-year's total for 1922 is also down considerably, the figures being 162,216, as against 237,371 in 1921. From all the Scottish yards the June output amounted to 18 vessels of 38,240 tons, compared with 25 vessels of 42,651 tons during last June. The half-yearly total for all the Scottish yards amounts to 75 vessels of 180,270 tons, compared with 155 vessels of 275,370 tons during the same period last year.

Vessel Launched, Scotland.—Messrs. Ramage and Ferguson, Leith, have launched the steamer Tasso, built for the passenger and cargo trade between Hull and the Baltic of Ellerman's Wilson Line, Hull. The vessel is 344 feet long, 42 feet 9 inches in breadth, and 22 feet 6 inches molded depth. She will accommodate 45 first class and 362 third class passengers. The vessel is of cruiser stern type with extensive gear for rapid handling of cargo. Triple-expansion engines, having cylinders 21½ inches, 36 inches, and 63 inches in diameter respectively, and a stroke of 42 inches, will be provided by the builders. Two large Scotch boilers, working at a pressure of 225 pounds and fitted with forced draft, will supply steam.

Trial Trip, England.—Steel screw steamer Eastmoor, built by the Northumberland Shipbuilding Company, Ltd., Howden, to the order of the Moore Line, Ltd. (Messrs. Walter Runciman and Company, Ltd.), Newcastle, left the Tyne on her trial trip recently. The Eastmoor is 415 feet long by 53 feet breadth and 35½ feet depth molded. She will carry about 9,200 tons deadweight and has been built to Lloyd's highest class. Propelling machinery supplied by North Eastern Marine Engineering Company, Ltd. Triple expansion engines have cylinders 27, 45 and 75 inches diameter by 51-inch stroke, with three boilers, 15 feet 9 inches by 12 feet, 180 pounds working pressure, with Howden's forced draft. Trial was satisfactory, and mean speed of 11 knots was attained.

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TRADE PUBLICATIONS

HEATING AND POWER PLANT SPECIALTIES.—The McAlear Manufacturing Company, 1920-7 South Western Avenue, Chicago, Ill., have ready for distribution a new 128-page catalogue, known as No. 27, which illustrates many new devices, including an individual temperature control valve, specialties for all power plants, vacuum and vapor heating systems, oil refining and water works plants, plumbing systems and marine service, together with illustrations showing their application and use. The individual temperature control valve is self contained and can be applied to any radiator, old or new, without additional piping other than the supply and return. When the thermostatic member is set for the desired room temperature, it automatically controls the opening and closing of the valve. The catalogue contains a very comprehensive detailed description of all specialties.

VULCABESTON.—The Johns-Pratt Company, Hartford, Conn., has just distributed its first catalogue which deals exclusively with Vulcabeston products, which include various forms of air pump, rod and valve stem, asbestos packings, pump valves, disks, bushings, rings, gaskets, washers, etc. Complete descriptions of the various products, together with price lists, are included in the pamphlet.

SEAMLESS STEEL TUBES.—The first of a series of illustrated bulletins, describing the manufacture of seamless steel boiler tubes, has been published by the Standard Seamless Tube Company, Pittsburgh, Pa. This first bulletin includes the manufacturing processes up to the point of piercing the solid billet and by means of illustrations gives an excellent idea of the equipment and methods employed. The second of the series of bulletins will be published within a short time, showing the tube mill operations, including the piercing of steel billets.

FUEL OIL BURNING SYSTEMS.—A catalogue, consisting of three bulletins describing mechanical fuel oil burning systems and fuel oil burners in which the oil is atomized by low or high pressure air and steam, is being distributed by Schutte-Koerting Company, Philadelphia, Pa. The catalogue discusses thoroughly the installation, operation and maintenance of oil burning equipment, the characteristics, requirements and functions, as well as the relative merit of mechanical spray oil burners, the use of air control registers, oil pumping outfits and fuel oil heaters. Instructions are given for the general arrangement of steam boiler furnaces for burning oil.

PREVENTING CORROSION OF BOILER TUBES.—A complete treatise in bulletin form on the prevention of corrosion in boiler tubes has been published by the National Tube Company, Pittsburgh, Pa. The subject of corrosion in general is treated, followed by details showing how this expensive item of locomotive boiler operation may be eliminated or reduced. This section includes methods of treating feed water, types of repairs and the like. The problem in the case of power and heating boilers is less difficult to remedy than for locomotives, being mainly a case of proper purification and softening of the feed water. In marine boilers the treatment of feed water is much the same as in stationary units. Authorities on the subject of corrosion have collaborated in preparing material for this bulletin.

PNEUMATIC TOOLS.—Two folders (special publication No. 686) have been sent out by the Chicago Pneumatic Tool Company, showing by illustration and description the great number of possible applications of the company's pneumatic and electric tools. These bulletins constitute a general review of riveting and chipping hammers, grinders, drills, air hoists, compressors, Semi Diesel oil engines and other products, with interesting notes on the history and development of the company and its devices, together with statements on the performance of many of them.

FLUE GAS ANALYSIS.—A new type gas filter for preparing flue gases for analysis, known as the double disk "Pyro-porus" filter, is described in a bulletin recently issued by the Uehling Instrument Company, Paterson, N. J. In addition to the details of the filter, an outline of its installation and uses are given, together with illustrations, showing its position in relation to the gas sampling pipe and boiler.

ARMSTRONG STOCKS AND DIES.—Catalogue No. 17 has just been published by the Armstrong Manufacturing Company, Bridgeport, Conn., giving detailed descriptions and prices for Armstrong stocks and dies, water, gas and steam fitters' tools and pipe threading machines. A special section of the catalogue is devoted to details of new machines for threading and cutting pipe. These are built in various sizes for both hand and power drive.

POWDERED FUEL EQUIPMENT.—A catalogue having as its object the explanation to prospective users of the advantages, construction and operation of the Grindle powdered fuel system has been published by the Grindle Fuel Equipment Company, Harvey, Ill. The complete system of stowing, drying, pulverizing, conveying and burning coal eliminates all handling of fuel by hand, shovels, wheel barrows, or industrial coal cars, also firing tools, grate bars, etc. The catalogue contains specifications and illustrations of standard equipment, but special types can be furnished to meet any particular condition.

BOILER TUBE CLEANERS.—The problem of eliminating the heat waste due to the formation of scale in boilers is dealt with at length in a catalogue sent out by the Liberty Manufacturing Company, Pittsburgh, Pa. Water turbine cleaners of various types, equipped with different style heads are described with the special uses for which they are best adapted. Pneumatic cleaners of high power in which steam can also be used are also illustrated and described. Mention is made of pneumatic cleaners for fire tube and return tubular boilers, arch tube cleaners and special cutting heads.

MARINE SOCIETIES

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Marine Engineers' Supply Men's Association
Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers
Secretary—B. G. Barnes, 47 Saville Avenue, Quincy, Mass

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Headquarters 311-315 Machinists Building, Washington, D. C.
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15 Whitehall St., New York City
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5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland
39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders
Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated
The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

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